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Clearer Air?

TO assume that with Thursday's further Commons debate on the Prestwick affair we have heard the last of the recriminatory wrangling, and that words will at once be followed by deeds, is probably to indulge in wishful thinking. Nevertheless, a forthright summing-up by the Attorney-General, Sir Hartley Shawcross, unobscured by party-political red herrings or by the operational technicalities which so befogged members of both Houses during the earlier debates, at least served to put the whole unfortunate business into some sort of perspective; and it carried with it a promise that something is going to be done which, it is to be hoped, will prevent a repetition in the future.

To recapitulate for a moment, the matter being debated arose out of the disaster to a K.L.M. Constellation at Prestwick last year, when 40 people lost their lives. Subsequently, the evidence was examined by a Court of Inquiry, whose findings, when eventually published, included criticism of actions by the M.C.A. meteorological and control staffs. This led Lord Pakenham as the Minister concerned, to issue a statement (with the concurrence of the Air Minister) expressing his disagreement with certain of the criticisms and refusing to accept that any individual member of the control staff could be held responsible for the accident. Understandably, the Minister's apparent arrogation of the right to dissent from the findings of an impartial Court of Inquiry led to a storm of criticism, which included a protest from the President of the Court, Mr. T. P. McDonald, K.C. Opposition members, and a large section of the National Press, demanded the Minister's resignation.

Several Parliamentary debates followed culminating in that of last Thursday, when, as we have said, the Attorney-General spoke. He was replying to an Opposition motion, moved by Sir David Maxwell Fyfe, that reports on facts and causes of such accidents should be made by a statutory court whose conclusions should be accepted as final (subject to appeal or re-hearing) in order more firmly to establish confidence here and abroad.

Complete Overhaul Favoured

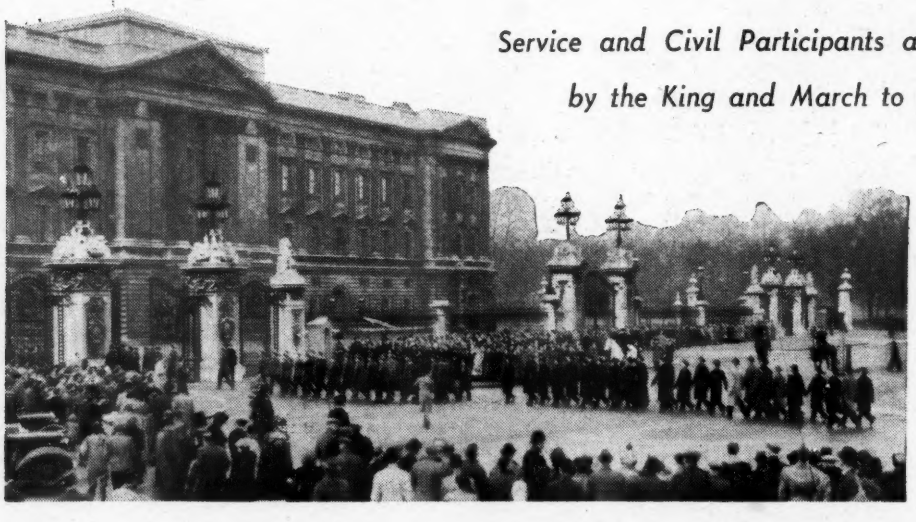
The broad facts that emerge from the Attorney-General's reply are that, after reviewing the Prestwick evidence, he supports the Minister's contention that blame had been unfairly placed; that while he would not permit it to be interpreted as criticism of Lord Pakenham, he favoured the idea of a complete overhaul of accident-investigation machinery; that (nevertheless) an administrative tribunal could not be allowed to make decisions that might fetter the Minister in his constitutional responsibility to Parliament; but that the Minister must consult the Law Officers of the Crown, as well as his own experts, before making any public dissension from a tribunal's conclusions.

From the outset, the controversy has centred not so much upon the fact that the Minister dissented from the findings as upon the manner in which he did it. Remarks made in the Commons suggest that some members would have been prepared to support him had he chosen a less debatable method of publicizing his objections.

The outcome of the motion—a defeat by 246 to 111—naturally left the Opposition far from satisfied. The Attorney-General's statement does not, on the face of it, suggest that the recommendation of the Newton Committee (endorsed by the Guild of Air Pilots and Navigators) that "an air accident board independent of the Ministry of Civil Aviation" is likely to be adopted in its entirety; nor has any mention been made of the necessity—in our view, a very grave necessity—for speeding-up accident-investigation in general. Notwithstanding, the latest debate has at least served in some measure to clear the air and pave the way for ameliorative action. Whatever the nature of the machinery finally established, it may be safely assumed that Lord Pakenham, and his successors, will (and we say it with no imputation against their honesty in following their own consciences) tread warily in future. Britain is too much of a Clapham Junction on the world's air routes for any risk of tactless action by the station-master to be countenanced.

HONOUR to the AIR LIFT

Service and Civil Participants are Inspected by the King and March to the City



After assembling at Wellington Barracks the parade marched to Buckingham Palace for inspection by the King.

"Flight" photograph.

TWO hundred and sixty men and women of the British Commonwealth and the United States, representing all those who helped to keep Berlin alive during the protracted months of the Air Lift, last week received the honour and appreciation of Britain, as expressed by Royalty and the City of London. At Buckingham Palace on December 7th they were reviewed by their Majesties the King and Queen, and, after marching through London streets, were welcomed by national, civic and Service leaders at Guildhall.

Unprecedented, and on a scale unforeseen, the Air Lift was nevertheless an onerous duty, born of necessity, throughout its duration; and when completed it was a solid achievement, as opposed to a sharp, dramatic victory preceded by spectacular conflict. It was thus fitting that the Air Lift parade should have an atmosphere of quiet dignity rather than of martial splendour. The diverse composition of the marching columns represented well the outstanding teamwork which made the operation such an historic success.

At Wellington Barracks, the 260 assembled in seven flights. Leading the parade was A. Cdre. J. W. F. Mercer, the British Air Lift Commander; behind him came No. 1 Flight, composed of 93 aircrew, officers and non-commissioned, of the R.A.F. and Dominion Air Forces, led by G/C. B. C. Yarde, who commanded Gatow throughout the Lift. Ground crews, R.A.F. and W.R.A.F., made up the next flight, totalling 87, and 24 members of B.A.O.R. represented the Army men mainly responsible for bringing to the aircraft, loading and unloading the supplies. The fourth flight was made up of the three American occupying Services, the airmen conspicuous in their new-style blue uniforms. In the familiar blue and gold of the airlines were 18 members of the British airways corporations and charter concerns. Differences in insignia were imperceptible, and one felt this to be perfectly symbolic of the harmony with which 17 companies jointly provided the Civil Lift. Finally came 12 members of the Control Commission and, in the small seventh flight, nine representatives of the welfare services.

Led by the R.A.F. Central Band and Nos. 2 and 4 Regional Bands, the parade moved off to the Palace quadrangle for the Royal inspection. For nearly 25 minutes, the King and Queen moved among the ranks and spoke personally to members of each flight. Then, at 11.55, began the march eastward, by way of The Mall, Trafalgar Square, the Strand, Fleet Street and Ludgate Hill.

With pageantry and warmth, the old City took the men and women of the Air Lift to its heart, honouring them, as it had lately honoured the men of the *Amethyst*, with a luncheon in Guildhall. In fine style the flights swung into Cheapside and turned through King Street to Guildhall Yard for their inspection by the Lord Mayor, Sir Frederick Rowland, who was accompanied by the Chief of Air Staff. The assembled City dignitaries, variously robed, made a picture which those on parade will not soon forget.

Under the temporary roof of devastated Guildhall, and within its bricked-up walls, bearing battered monuments of great personages, the company sat down to lunch. Mr. Attlee was there, with other members of the Government, Marshal of the R.A.F. Lord Trenchard, the High Com-

Their Majesties move among the ranks; they spoke to several members of each flight.

On the way to Guildhall for the second part of the ceremony: The parade, led by A. Cdre. Mercer, crossing Ludgate Circus.

missioner for New Zealand, the Acting High Commissioner for Australia, Admiral of the Fleet Lord Frazer, and senior officers of the U.S.A.F. Proposing the toast "The members of the R.A.F. and their comrades engaged in the Berlin Air Lift," the Lord Mayor read a message from Mr. Ernest Bevin. The Lord Mayor described the Air Lift as an inspiration to the world and as a demonstration that the free democracies were equal to any emergency.

Acknowledging the toast, Air Marshal T. M. Williams, C.-in-C., British Air Forces of Occupation, Germany, recalled that on the British side the Air Lift was started by his predecessor in Germany, Air Marshal Sir Arthur Sanders (now V.C.A.S.), and Air Marshal Sir Brian Baker, A.O.C.-in-C., Transport Command. On the American side it began under his very good friend General Joe Cannon, Commander of the U.S.A.F. in Europe, and then, as the U.S.A.F. rapidly flew-in transport aircraft from all over the world, Major-General Bill Tunner was called in to take charge. When the Combined Air Lift Task Force came into being A. Cdre. Mercer, A.O.C. No. 46 Group, R.A.F., was appointed second in command to Major-General Tunner. Air Marshal Williams said that many lessons had been learned.

On behalf of the U.S.A.F., Major-General Tunner extended his deep appreciation for the recognition accorded his Service at this "brilliant and heart-warming ceremony." He said that untold numbers of men and great amounts of material and equipment could have been saved, and that there would have been fewer worries in air-traffic control had larger freight-hauling aircraft been available.

The Right Hon. Arthur Henderson remarked that the relationship between the City of London and the R.A.F. had always been close and cordial, finding practical expression in the early days of the R.Aux.A.F., when the City became responsible for No 600 Squadron. The Air Lift was a magnificent and, indeed, a unique achievement.

I WOULDN'T HAVE MISSED IT . . .

A Civil Air Lift Chief Pilot Looks Back on Eleven Crowded Months

A YEAR ago, I'd been there for two weeks, and we were all still shivering in the drearily uncomfortable attic over the officer's mess at Wunstorf.

I lay on my bed last night and thought about that attic; memories, personal, technical and business, elbowed their way into my mind like a series of news flashes. (I like the impression given by the expression "elbowed their way." They were, of course, sucked in by the vacuum but one couldn't really say that straightaway. Anyway, there they were and here they are.) I thought of the first few weeks when we were all very new to the job and were having our legs pulled unmercifully by the R.A.F.; I thought of those bitterly cold nights with the snow whipping horizontally through the gaps in the roofing-tiles. I could see the wire brace hanging from the rafters, with its outsize turnbuckle, and remembered the night when some enquiring mind had tightened the turnbuckle until one of the large chandeliers in the dining-room, two floors below, had suddenly and reluctantly shot upwards through the ceiling.

It was all rather like that—have a crack at it and hope to learn from one's mistakes. We certainly tried to learn quickly enough. The leg-pulling of the R.A.F. crews saw to that. We had arrived in a period of bad weather, with low cloud, drifting rain and fog, and we were all struggling to get used to BABS. The outspokenness of the R.A.F. crews put our rank and file on their mettle, whilst, at a higher level, they were all sympathy and help. I cannot be too grateful for the assistance that we received from the navigation and signals leaders and from the engineering staff. On the ground, we were almost always in a position to bargain—eye-bolt for eye-bolt, and gear-tooth for gear-tooth—and it was surprising to note the inflated values that much-needed parts commanded. In the air, it was rather different. The signals leader who cheerfully came with me on our initial BABS training ran the risk of life-long twitch, apparently without hope or thought of reward. Time marched, months passed, the jeering died and we all finished up with very good friends amongst the Service crews. I still meet them around the routes and they have all, so far, agreed that they enjoyed it.

I stared out of my window at the stars and remembered that I was due for Damascus in the morning and that I must therefore get some sleep. I wondered vaguely about the weather in the Med. and that brought me back to the Lift again. However much we disliked the monotony of the job at the time, and however worried we might have been about the weather then, the time spent at Wunstorf was the finest training in weather-appreciation and consequent action that one could possibly imagine. We allowed our pilots freedom of decision (admittedly slightly influenced by my malignant eye!) and there is nothing more difficult than deciding not to go when others are taking off. I think that confidence in equipment, and the ability to use it, taught us not to worry quite so much about bad terminal conditions as we had done previously. Once you were airborne, the knowledge that there was another aircraft just six or seven miles behind, helped you through the severest thunderstorm without a single thought. I know that, personally speaking, weather which would have laid me prostrate in a suitably darkened room for at least three hours before take-off, practising Yogi, eventually only affected me after take-off with the awful realization that I had done it again, and was faced with a landing in conditions of which my mother would most certainly not have approved. I like still to think that it was training,

HONOUR to the AIR LIFT . . .

but maybe, on the other hand, we were just numb!

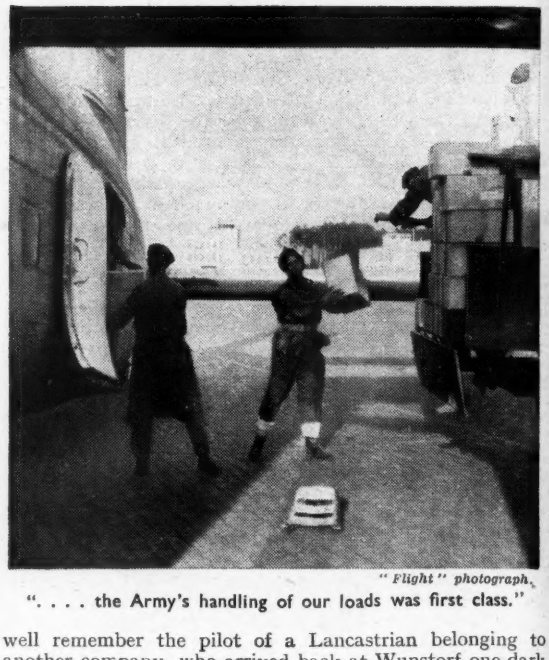
I was much impressed by the value to be gained, on a job of this nature, from flying as crews. We eventually had sixteen crews, consisting of three members each, engaged whole-time on the Lift; and we had very few differences of opinion amongst them. The strong helped the weak and there were obvious advantages to be gained from operating always with the same people. I was outstandingly fortunate. I had the expert help of our two most senior radio officers, and was shepherded round the circuit with unwavering vigilance by a first officer who had put in a little practice to the tune of two hundred and fifty lifts before joining my crew. All the crews worked hard and conscientiously, with only very occasional prods needed. This was a tribute to their loyalty for they were not particularly pleased to be in Germany, nor were they too conveniently housed. They were billeted at Bad Nenndorf, approximately 14 miles from the airfield, and had to endure a bus ride to and from work. Forty minutes in a bus on that road at three o'clock on a winter's morning stretched moral fibre to the utmost.

They had their relaxations, of course. Bad Nenndorf had been a very prosperous spa and all the amenities still existed. With the very active co-operation of B.E.A., these amenities were gradually brought into full working order, to such fine effect that on at least a dozen occasions the winter gardens bandstand was in use, however improperly, until well after midnight. I have always inclined to the view that, within reason, such incidents indicate high morale amongst the aircrew involved and therefore only intervened when morale looked like blowing the top off. Myself, I slept in the airfield camp on the instructions of august authority, so that I could be (and was) easily woken up to be informed of the hundred-and-one set-backs and calamities as they occurred. I had given instructions that nothing should be kept from me, and the operations officers soon found out that my temper on discovering that I hadn't been told was far worse than it was on being woken up for the third time during any single night. The operations officers learnt their job quickly, and were to discover that the Army's handling of our loads was first class. Any hold-up was ruthlessly punished by the Army authorities and we could guarantee to refuel and re-load a York carrying ten-and-a-half short tons in twenty-five minutes. My whole impression of loading is one of constantly increasing efficiency. Remembering that the load had not only to be put on board but also had to be properly distributed with C. of G. considerations in mind, I think that loading was a triumph.

Boring, but Satisfying

The actual flying round the circuit was boring in the extreme; and yet, at the same time, there was some very definite sense of a job well done in arriving yet once again over the final check beacon on time, of delivering yet another ten-and-a-half tons of dried potatoes, in helping to shift another item in the 32,500 short tons that was our company's eventual total. I have often tried to visualize that amount of food and petrol stacked up on the tarmac, and myself with orders to shift it all within the space of nine months, and I try to imagine what requirements in aircraft and crews I would stipulate. I would certainly start off with more personal gold braid! I am quite sure that although the normal person at home was aware that a tremendous effort was involved in supplying Berlin, few appreciated just what it means to have to fly-in everything that a city needs. I know that I hadn't really considered it myself, and to listen to the various aircraft reporting their loads to Gatow Control twenty miles from the last check beacon rarely failed to interest me. Three such messages spring readily to mind: a Dakota with a load of soup plates and cotton wool; a Freighter with a fire-engine ("bet its a Pyrene." It wasn't); a Dakota with "a load of miscellaneous rubbish."

Perhaps I should have said that it was mostly boring. But we did have our moments of extreme excitement. I



"Flight" photograph.

". . . . the Army's handling of our loads was first class."

well remember the pilot of a Lancastrian belonging to another company, who arrived back at Wunstorf one dark and stormy night, with radar u/s, no radio compass and the airfield's G.C.A. out of action. After milling around the airfield in the cloud above me, he called up the airfield control with: "Hallo, Tower . . . . I must say that I'm not awfully happy about all this." He was eventually diverted to Hamburg—and, I subsequently learnt, taught that city a sharp lesson.

The monotony was also broken by the R/T chatter. In general, the British R/T discipline was good and became better as the weather became worse. Wit, although for the most part corny, was pitiless. It just wasn't worth making an operating mistake: people would still be talking about it hours afterwards on any channel you cared to select. The Americans' discipline was below ours, but they were usually very funny. Their signature tune was the *Woody Woodpecker's Song*. I rather think the R.A.F.'s choice would have been *Green Grows the Rashes—O*, but you really need television for that. The Americans operated without radar and therefore needed far more ground control than we did. This mostly took the form of transmitting for "steers," which we found particularly trying. It made a horrible noise. There was a good deal of professional rivalry between their method of operating and our own; ours appeared to them far too rigid, and theirs seemed to us far too happy-go-lucky. I remember one incident in which one of our captains had called "ten seconds late at the second turning point" and was immediately greeted with "They're pretty red hot, those British boys, aren't they?" from an American. There was a Canadian in the aircraft behind ours who cracked back: "Save your breath, Bud, you may need it for a steer." Surely food for thought here . . . We were all sold on our method of operating with airborne radar (which the M.C.A. says has no application to civil traffic control) but the Americans packed them in just as fast and just as regularly and just as safely with only a radio compass on board and intelligently applied ground control.

Well, there it was. One cannot help feeling some personal pride about having taken part. It gave me several prematurely grey hairs and put years on my life, so that a small boy who came to tea the other day and asked, "Who is that old man?" (pointing to the Copenhagen figure of a man of about ninety that stands next to my photo on the sitting-room bureau) was told, "That's my Daddy" by a daughter used to the faltering step and the rheumy eye. But I wouldn't have missed it. But definitely not, Begelbaum.

L. B. G.

HERE and THERE

Yet Another Customer

VENEZUELA is the twelfth nation to adopt the de Havilland Vampire for its air force. The first aircraft was due to arrive in Venezuela last Saturday, the country's aviation day. By their record sale of Vampires, de Havillands have not only contributed greatly to British export activities but have also strengthened the air defence of many friendly nations.

A Christmas Suggestion

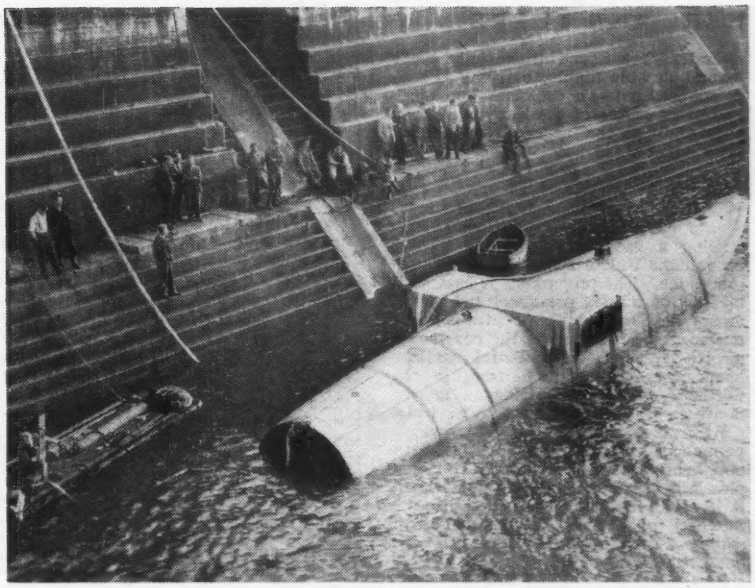
THE Air Public Relations Association states that many excellent articles, suitable as Christmas gifts, have been produced by a number of 100 per cent disabled ex-members of the R.A.F. The workmanship of the goods produced is excellent, and prices are competitive; among the items available are salmon and trout flies, brooches, sheepskin goods and powder puffs. Orders and enquiries should be addressed to S/L. J. Holt, National Liberal Club, Whitehall Place, London, S.W.1.

A Victory for Cranwell

MANY distinguished Service spectators, including Air Marshal Sir Basil Embry and Air Marshal Sir Hugh Saunders, watched the Royal Air Force College, Cranwell, defeat the Royal Military Academy, Sandhurst, at Cranwell on December 7th. The R.A.F. College scored six points (two tries) to Sandhurst's nil. It was the second occasion on which Cranwell has won the annual game between the two cadet institutions. Before 1948, Sandhurst had enjoyed unbroken success for 20 years.

Anti-Sonic

ADDRESSING the American Chamber of Commerce at a luncheon held in London last week, Sir Frederick Handley Page expressed wonderment "that people should want to fly so fast." He thought that they should apply speeds to commercial needs and not merely let them be a question of maintaining national prestige. We could not afford to go on spending so much money on equipment necessary for high landing speeds. The time might come when machines would be able to operate from subsidiary take-off trolleys.



HIGH ALTITUDE AT SEA LEVEL : As recounted on page 759, this complete Ambassador main fuselage was recently immersed in a dock at Portsmouth in order to test the pressurization system. A pressure of 9.8 lb/sq in was reached before failure occurred—equivalent to more than twice the cabin differential pressure of the Ambassador at its normal operating altitude.

Testing Non-skid Brakes

IT is understood that the Dunlop Rubber Co., Ltd., in consultation with the Ministry of Supply, is to fit six complete Hytrol units to the braking systems of Canberra and Tudor IX aircraft for type-approval and performance-acceptance tests. This is the American maximum-torque, non-skid device developed by Hydro-Aire, Inc., and described in *Flight* of September 1st.

WASP IN ITS BONNET ? An interesting feature of the new 12-seat Sikorsky H-19 helicopter for the U.S.A.F. is the unusual and accessible position of the engine compartment ; the installation is reminiscent of the Bristol Freighter's nose-opening doors. The type of power unit installed has not yet been specified, but it is likely to be a 550 h.p. Pratt Whitney Wasp radial of the R-1340 series.

News from India

DR. S. P. MUKERJEE, India's Minister of Supply and Industry, last week made the announcement that his country had secured the services of Professor Willy Messerschmitt, famous German aircraft designer. The scope of Prof. Messerschmitt's future activities has not been defined, but Dr. Mukerjee's statement was linked to a reference to the work of the state-owned Hindustan Aircraft Corporation. This company, he said, would produce a new type of fighter, which would be ready for demonstration by mid-1950.

Britain's New Racing Car

FLYING people who are also car-racing enthusiasts will be interested to learn that the new 1½-litre B.R.M. Grand Prix racing car, produced by co-operation between leading British car and component manufacturers, is being revealed this week; Friday's issue of *The Autocar* will contain the first illustrated description. The car presents several unique features. It has a 16-cylinder engine with two-stage centrifugal supercharger, and has already produced about 400 b.h.p. Normal operating range is from 7,000 to 12,000 r.p.m., and the supercharger will run at speeds up to 40,000 r.p.m. The customary coil springs and torsion bars of racing car suspension systems have been abandoned, a new, weight-saving Lockheed strut having been developed to combine the functions of spring and shock absorbers.

For Sale ?

THE U.S. Navy Department is said to be considering the sale of its two 92-ton Lockheed Constitution transports, on the grounds that their operating expenses are too great. An earlier suggestion that the aircraft be put in reserve was not taken up, as the Department required data on the operation of large

HERE AND THERE . . .

aircraft. The Constitutions have made several notable flights, carrying U.S.N. personnel, and—on occasions—pressmen and other guests of the Navy, and were claimed to be the largest "commercial-type" aircraft in use.

Italian Radar Chain

THE Italian Government is reported to have begun preparations for installing a radar early-warning system around the Italian coast and the Northern plains. The programme is hampered by lack of trained personnel and equipment: only one training centre is being operated (near Ostia, on the coast west of Rome), but experimental stations have been set up at Ferrara, in the northern plain near Bologna, in the Southern Puglia region, and in Sardinia.

At these points, sites will be tested for permanent installations. Equipment now being used was assembled from surplus Allied war material. Negotiations, it is said, are being conducted for the purchase of British, U.S. and French equipment, but no definite arrangements have been announced.

Mach One Plus

SINCE America is probably the world's most publicity-conscious nation, it is surprising that some of her most outstanding achievements in the realm of high-speed flight have received comparatively little attention. The majority of people in this country, for example, have never heard the name of Captain Charles Yeager, U.S.A.F., who was the first man to fly faster than sound.

Capt. Yeager recently made some brief observations on his experiences in an interview with the local daily newspaper at his home town, Dayton, Ohio. He stated that he had flown the Bell X-1 rocket-powered research aircraft at "much more than 100 m.p.h. faster" than the speed of sound—some 760 m.p.h. at sea level. Commenting on the physical effects of supersonic flight, he observed that it was no different from "sitting in your armchair at home."

Expensive Oversight

AT Bromley Magistrates' Court on December 2nd, Francis Gonsalves, a private pilot, was fined £20 and 5 guineas costs for contravening article 16 of the Air Navigation Act 1949, in that he, while in command of an aircraft, failed to satisfy himself before a flight that sufficient fuel was being carried. He pleaded guilty. It was stated in evidence that on July 15th he flew from Croydon to Wood Vale, Lancs, and was forced down by lack of fuel in Duke's Meadows, Chiswick, while returning to London.

REINCARNATION: Many local residents may well find something familiar in the appearance of this 35 m.p.h. all-electric car, now running in the Bristol area. Credit for a particularly ingenious adaptation of "war surplus" goes to Mr. Ralph Nelson, who designed the car around the nose of a Bristol Blenheim.

A Hatfield Tradition

ALL five founder-directors of the de Havilland Enterprise were present at the tenth annual meeting of the Twenty-year Club at Hatfield on December 2nd. As its name implies, the club is for members of the company who have completed 20 years' service, and this year there were 27 new members. According to custom, each was presented with a £20 cheque and a certificate.

The certificate always depicts some event of twenty years ago, and, for 1949, takes the form of a Wootton oil painting. On each certificate is a reproduction, showing Moth G-EBTD flying over the Stag Lane factory; in the summer of 1929, a Gipsy I flew 600 hours under seal in that aircraft, a fact which Sir Geoffrey paralleled with the recently approved 600-hr Goblin overhaul period. Presentation of one of the certificates is illustrated below.

NEWS IN BRIEF

THE Aero Club of Uganda has sent a donation of £45 to the R.A.F. Benevolent Fund in London. The money was forwarded by R.A.F. headquarters in East Africa.

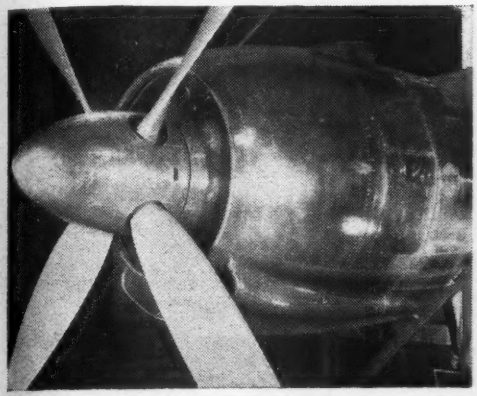
* * *

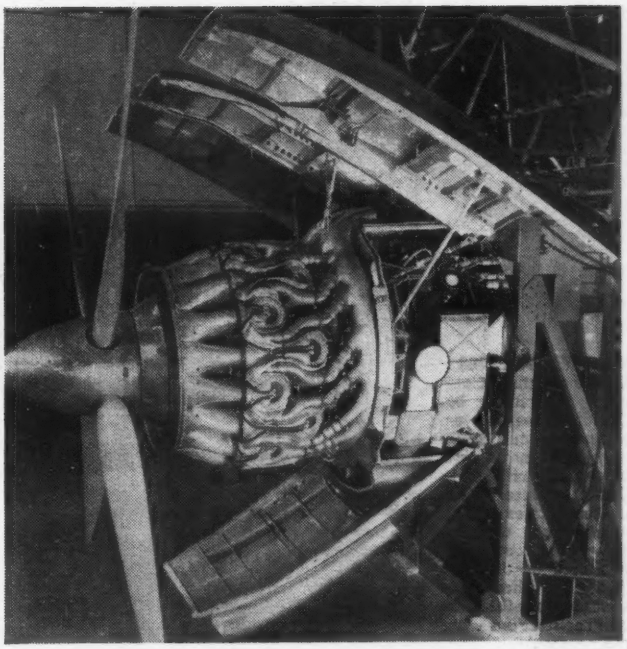
Col. Charles Lindbergh, the first pilot to fly the Atlantic solo, has been awarded the annual Wright Brothers Memorial Trophy for "significant public services of enduring value to aviation in the United States." Col. Lindbergh is at present a special consultant to the U.S.A.F. Chief of Staff.

* * *

The Ryan Aeronautical Company has produced a "Super" version of the Navion, powered by a 260 h.p. Lycoming engine instead of the 205 h.p. Continental installed in the standard version. External differences are few, but performance is improved considerably; the Super Navion cruises at 170 m.p.h. and has an initial rate of climb of 1,250 ft/min.

INITIATE: (Right) Sir Geoffrey de Havilland presents the customary certificate to Mr. S. H. Courtney, a "new boy" of the D.H. Twenty-year Club, mentioned above.
BUSINESS TRIP: (Below) Canadian-born S/L. Bill Waterton, chief test pilot of the Gloster Aircraft Company, flew home recently to make the first test flights of the Avro Canada XC-100 jet fighter. He made the trip in a T.C.A. *North Star*, piloted by Capt. Joe Crispin (left).





Modifications apparent in these views of the new Centaurus 661 installation include the smaller spinner, without cooling fan, and altered intake design. Exceptionally good access to the Ambassador power-plant is given by the "petal" or "clover-leaf" type of cowling.

AMBASSADOR PROGRESS

Testing of Wing Structure and Pressurization : Engine Development

SUCCESSFUL completion at Farnborough, on December 6th, of the third strength-test of the full-span Ambassador wing specimen, marked the completion of a progressive year of testing the design and construction of the whole Airspeed aircraft. The wing stood up to the target loading of 100 per cent—with an effect equivalent to a 50 ft/sec up-gust on the fully loaded aircraft at cruising speed—and ultimately failed at 120 per cent.

Exceptionally consistent standards of workmanship and materials are indicated by the fact that failure took place simultaneously, and at the same point, on each outer wing. When the 100 per cent loading was attained, a technical fault in the recording circuit occurred, and the wing specimen was left in this highly stressed state for 18 minutes before the test was continued—a further impressive proof of the integral solidity of the structure. Since the previous test a number of modifications had been made to the wing; the gain in strength had been approximately 40 per cent for a corresponding weight increase of only 280 lb. The basic design of the wing has not been altered in any way.

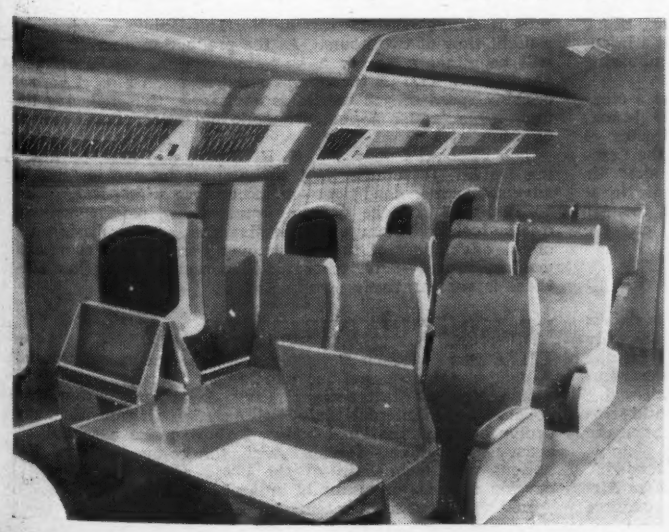
In the test, the R.A.E. made use of electronic strain-gauging equipment, developed by the Airspeed research department and known as the Polygraph recorder, which gives immediate and continuous readings.

The Ambassador pressurization system has been the subject of another important item in the development programme. The control-cabin, windows and detail structure have been checked in one fuselage test-specimen, the centre-section area and complete fuselage aft of the control-cabin bulkhead in another. The specimen used for the latter test was submerged in a dock at Portsmouth and pressure-filled with water, dyed a deep blue; the colour enabled leaks to be detected immediately. (Since water is virtually incompressible, the pressure-energy stored in it is very small and is almost instantaneously released when initial failure occurs; the area of subsequent secondary failure is thus reduced to a minimum.) Testing gave satisfactory results. The frontal section (tested at de Havilland's) withstood 9.9 lb/sq in and the complete specimen, at Portsmouth (illustrated on p. 757), failed at 9.8 lb/sq in. Normal operating pressure differential of the Ambassador will be 4.16 lb/sq in.

Airspeed's pre-production programme is now well under way. A pre-production aircraft is due to be delivered to B.E.A. next March, and will be used—fully furnished—for route surveys. Delivery of the complete batch should begin in January, 1951, and be completed by the end of that year.

Ambassadors for B.E.A. will have Centaurus 661 engines of 2,700 b.h.p. for take-off, as compared with the Centaurus 631s at present installed on the first two prototypes. A mock-up and a test-mounting for the 661 have been constructed at Christchurch, and the first prototype (G-AGUA) is at present undergoing fitment of a 661 in the port nacelle, the starboard 631 being retained.

The mounting of the Centaurus 661 differs considerably from earlier versions, the cooling fan having been removed, a smaller spinner incorporated and a combined oil-cooler and twin air-intake fitted underneath. Particular attention has been paid to maintenance, and the power unit now has a neat four-piece "petal" cowling, providing greater access. On G-AGUA the Centaurus 661, with torquemeter, will provide a direct comparison with the 631, and the merits of the cooling systems will be tested.



An Ambassador interior mock-up, showing the standard B.E.A. seating arrangement. Three seats are placed on one side of the gangway, two on the other.

CIVIL AVIATION NEWS

ORIENT SKYLINER: One of the three Convairs operated by Orient Airways over the picturesque territory which forms part of the Karachi-Delhi-Calcutta route. The United States serial number on the fin above the Pakistan flag was used on delivery flights and these aircraft now have Pakistan civil registrations with the prefix AP.

SYNTHETIC STRATOCRUISER

THE C.A.A. has now announced certification of the Dehmel electronic flight-simulator, and training on this device will now form the major part of the semi-annual crew checks given by Pan American World Airways to the pilots of its Boeing Stratocruisers. Features of the Dehmel trainer were described by the Editor of *Flight* in his "Collecting a Stratocruiser" article in last week's issue.

According to regulations, airline pilots must every year undergo a refresher course and competency test at intervals not closer than four months. Previously all this time was flown on the aircraft itself, but now only one tenth of the required training-time need be flown on the aircraft. During the 14 months in which the $250,000 flight-simulator has been used by Pan American, 45 captains, 48 first officers and six second officers have been trained in Stratocruiser operating technique.

CEYLON DEVELOPMENT

THE possibility of services from Ceylon to Burma and Thailand, to be operated by Air Ceylon, is reported to have been the subject of discussions between the governments of the three countries. Mr. P. Nadesan, Ceylon's Director of Civil Aviation, has stated that, in view of the vast traffic potentialities in South-east Asia, it is his government's intention to enter into bilateral agreements with neighbouring countries.

Meanwhile, it is proposed to include Trincomalee as a stopping point in the internal service from Colombo to Jaffna, and a trial flight has already been made. The Director of Civil Aviation is understood to have discussed with the Commander in Chief of the East Indies fleet, Vice-Admiral Sir Charles Woodhouse, the question of using the Royal Naval airfield at China Bay in Trincomalee as a base for the Air Ceylon Dakotas which it is planned to use on the service.

CHANGING THE TUNE

POPULAR opinion amongst American aircraft industrialists and leading airline operators now seems to be definitely leaning towards the view that State aid is essential for the development of jet air liners. Earlier feelings that Government participation might be the thin end of a nationalization wedge are now, it appears, being modified by the fear that world-wide adoption of British jet transports may eventually remove the grounds for such speculation altogether.

"To say the least of it, America's national pride is offended," were the words of Mr. C. R. Smith, President of American Airlines and American Overseas Airlines, speaking on the subject before a meeting of the Chicago Association of Commerce. Mr. Smith advocated State aid as being justified by sound reasons of national interest, and stated that Congress should designate at once the Government agency which would have direct responsibility for the project. He expressed the view that at present the jet aircraft could be afforded only by national air forces and by Government-owned airlines, due to the costly design and construction and the higher daily operating costs. Its widespread use would depend on its ability to operate with a greater overall economy than existing types of aircraft. "The Government must participate in financing this transport development, or it may be long delayed," said Mr. Smith.

Is this growing chorus of cries for help purely a matter of "offended national pride" or is it due to a slowly dawning realization of the commercial potentialities of jet airliners?

VISCOUNT IN EIRE

THE Vickers Viscount recently made its second flight outside the United Kingdom, when it flew to Dublin for a demonstration before members of the Technical Committee of the International Air Transport Association. Having left Northolt at 1345 hr, the aircraft arrived over Collinstown at 1455, achieving a ground speed of 245 m.p.h. against a 30 m.p.h. headwind. The Viscount flew at 6,500ft. The present airline schedule for the Northolt-Dublin trip involves a flight time of two hours. As the production aircraft, which will be either a 40- or a 53-seater version, will use Rolls-Royce Dart RD/3A turboprops rated at 1,400 h.p., a normal cruising speed of 320 m.p.h. is envisaged, thus reducing the flight time (under normal economic operating conditions) to 66 minutes.

The Viscount's pilot, Mr. G. R. Bryce, said that, on reaching Dublin, 30 minutes had to be spent in stacking due to adverse weather conditions—an occurrence which lends point to the need for the exacting present-day requirements of reserve fuel for "stand-off" and diversion, and emphasizes one of the advantages of turboprops over pure jets for short and medium ranges—namely, that fuel consumption at low altitudes is comparatively small.

I.C.A.O. QUINQUENNIUM

FIVE years ago—on December 7th, 1944—representatives of more than 50 nations meeting at Chicago signed the Convention on International Civil Aviation. From that document the International Civil Aviation Organization was evolved—an international body which was also a specialized agency of U.N.O., designed with the co-operation of the nations and technicians of the world to help aviation to develop as a major means of international transportation.

In a statement made recently at Montreal, the vice-president

of I.C.A.O., Dr. K. N. E. Bradfield, reviewed the progress of the organization since its inception. He said that the first five years had seen the building of a secure foundation. A highly-qualified secretariat had been recruited and housed at Montreal, and much experience had been gained in operation. Dr. Bradfield said that it was obvious that I.C.A.O. could not realize its aims to the full unless it received the support of the world as a whole. Although 55 nations, operating more than 90 per cent of international civil air transport, were now members, a number of others, notably the U.S.S.R., were still outside I.C.A.O.

In the field of air navigation, I.C.A.O.'s most important work had been the creation of international standards and recommended practices for civil aviation. To date, nine sets of standards had been approved, covering maps and charts, aircrew licences, airworthiness, rules of the air, and telecommunications, and Dr. Bradfield expressed satisfaction that member nations were implementing these standards with commendable speed. Four "joint support" agreements, covering Atlantic Ocean weather standards, navigation and met. facilities in Iceland, Greenland and the Faroes, had been signed.

As far as the economics of civil aviation were concerned I.C.A.O.'s major effort was to attempt to draw up a multilateral agreement to govern the exchange of commercial air rights, thereby replacing the numerous bilateral agreements now existing. Further attention had also been devoted to elimination of many of the time-consuming formalities and excessive documentation which at present hindered the free flow of traffic across international borders. Standardization of such forms as passenger and cargo manifests and baggage declarations had already been accepted by I.A.T.A.

Close co-operation was maintained with the Universal Postal Union on the question of cost of airmail. Attention was also being devoted to the subject of burdensome insurance and multiple taxation of international airlines.

In the legal field, said Dr. Bradfield, I.C.A.O. had adopted and opened for signature a Convention on International Recognition of Rights in Aircraft. It had been signed by 24 nations and ratified by the United States, and it could be put into operation when ratified by two or more nations. The Convention, which is designed to afford international airline operators the largest possible measure of assistance in arranging and financing aircraft purchases, provides, among other things, for the recognition by all contracting States of the rights in aircraft constituted in any country that is party to the agreement.

SAFETY MEASURES

MINISTRY of Civil Aviation *Information Circular No.* 138 contains the complaint that flying accuracy, particularly under I.F.R. conditions, at present appears to be somewhat below the required standard. Recent radar plots obtained while I.F.R. rules were in force showed that, in maintaining height allocated, 80 per cent of all aircraft were within ±200ft, but among the remaining 20 per cent the average error was of the order of 500ft, occasionally even approaching 1,000ft. A tendency to lose height during turns has been noticed and in many cases pilots changing altitude are said to have overshot considerably before settling down to the new height.

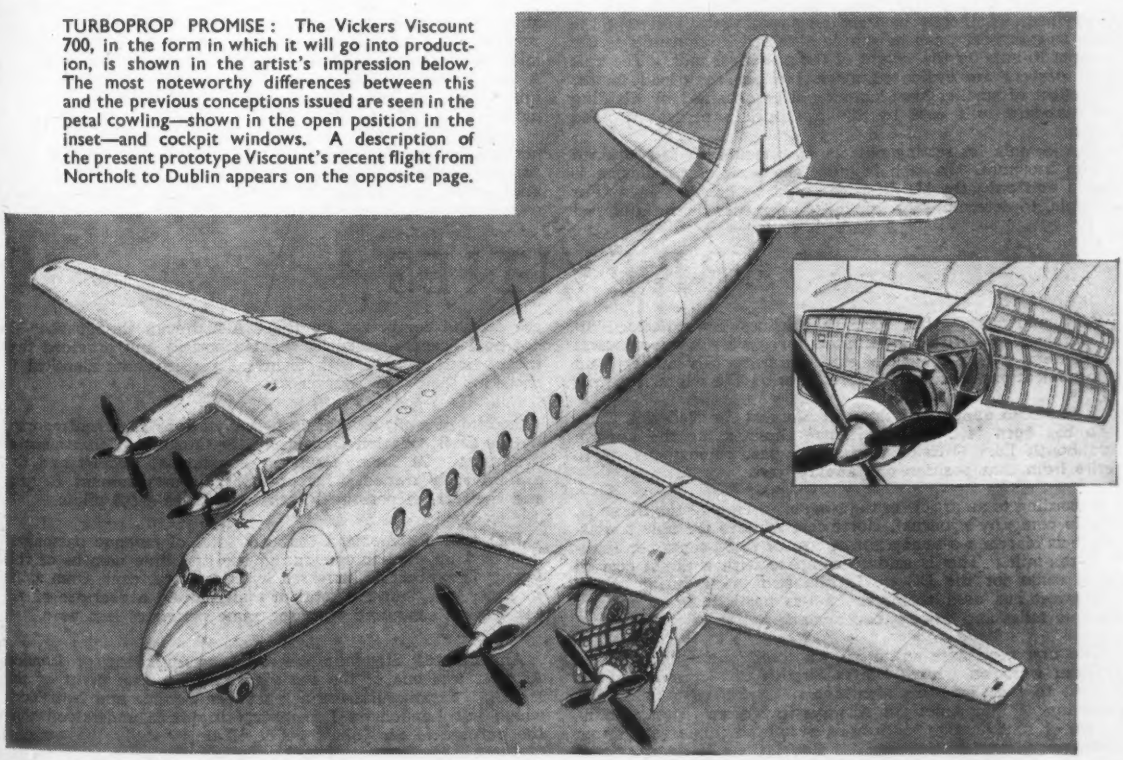
Similarly, navigation and position errors of as much as five miles, and occasionally more, have been noted at control-zone entry/exit beacons. The circular states: "unless aircraft are flown with the greatest possible accuracy under all conditions, attempts to ensure adequate safeguarding by appropriate control systems may be rendered ineffective."

The circular also states that complaints about low flying continue to be received from the public. An analysis shows, as might be expected, that the majority emanate from the vicinity of airports, where the noise level is unavoidably high. It is suggested that pilots should avoid making unnecessary long, low approaches, particularly across densely populated areas.

Circular No. 137 enumerates circumstances in which meteorological offices at State-owned airfields and airports in the United Kingdom are instructed to pass intermediate weather reports to Air Traffic Control. Among these conditions are: Changes of wind direction of 22½ deg at speeds of more than 15 kt; increases in wind speed of 5 kt or more; visibility changes ranging from 100 yd for 800-yd visibility to 800-yd changes for 2,600-4,000-yd visibility, and any weather change involving the onset or cessation of fog, thunderstorms or precipitation.

Circular No. 136, referring to the employment of automatic rhythmical-flashing navigation lights, now sanctioned for certain foreign aircraft flying over the United Kingdom, remarks that the use of similar equipment will be permitted on British aircraft in the near future. It points out that, to avoid confusion with aircraft thus lighted, a pilot finding himself in difficulties likely to necessitate a forced landing should not use the customary regular "on-off" flashes, but should resort to fairly rapid sequences of flashes alternating with pauses of a few seconds.

TURBOPROP PROMISE: The Vickers Viscount 700, in the form in which it will go into production, is shown in the artist's impression below. The most noteworthy differences between this and the previous conceptions issued are seen in the petal cowling—shown in the open position in the inset—and cockpit windows. A description of the present prototype Viscount's recent flight from Northolt to Dublin appears on the opposite page.



CIVIL AVIATION NEWS . . .

ASSESSING OPERATING COSTS

WITH the dual objects of assisting operators to assess the suitability of any aircraft for their particular needs and of providing a ready means of comparing the operating economics of competitive types in a standard set of conditions, the Society of British Aircraft Constructors has evolved a standard method for the estimation of direct operating costs. Recently issued in brochure form under the title *Standard Method for the Estimation of Direct Operating Costs of Aircraft*, the scheme has already been featured in handbooks describing new British airliners and, additionally, has been made available to the Aircraft Industries Association, the American counterpart of the S.B.A.C.

First suggested by the S.B.A.C. export committee, the plan was evolved by a special committee of the Society's technical board and the major part of the task was completed in a little over a year. While admitting that any system of this kind must have a certain amount of latitude and can only be general in scope, the Society considers that the method closely approaches the ideal, because it includes formulæ of a kind which, after reference to their derivation, allow the assumptions to be adjusted to meet any special circumstances.

The method deals only with direct operating costs. Only one exception to the principle of excluding indirect costs has been made, in that workshop overhead expenditure is included in the labour rate quoted for airframe, power-plant and airscrew maintenance and overhaul.

In the preparation of the standard method, the Society considered three distinct expenditure headings: (a) annual costs (expressed as an hourly cost by dividing by utilization), comprising obsolescence and insurance, (b) fixed hourly running costs, comprising maintenance and overhaul expenses, and (c) hourly running costs—which vary with the speed or stage-length under consideration—including aircrew cost, fuel and oil and landing charges. An addition of all items under headings (a) to (c) then gives total hourly cost from which other costs can then be resolved. The cost per ton mile, for instance, can be found by dividing the total hourly cost by the stage-speed and the payload appropriate to the stage. This unit immediately gives a measure of the overall commercial efficiency of the aircraft and, for purely freight-carrying aircraft, is a suitable final expression.

The cost per passenger mile (assuming that each lb-weight of payload, whether it be freight or passengers, will cost the same to transport), can be simply obtained by multiplying the cost per lb-mile by the weight of the passenger unit. The unit costs derived are evaluated for a 100 per cent load factor. The effect of smaller load factors can be obtained by dividing the standard unit cost by the appropriate percentage load factor.

The formula for setting out the costs summary is contained in the brochure. In each instance the basis of calculation is shown and only the blank spaces need to be filled in. For example, to determine the annual obsolescence of the equipped airframe and spares, only the initial cost of the equipped airframe has to be inserted in the two blank spaces of the formula under that heading. The same formula applies to the power plant and spares and to airscrews and spares, with the addition of the number of engines and airscrews respectively.

To discover the cost of insurance it is only necessary to insert in the appropriate places the first cost of the aircraft and the number of seats. The brochure also describes how the costs set down have been derived. For example, after consultation with operators, the first-line life of an airliner was assumed to be eight years, with a residual value of 20 per cent. at the end of that time. Similarly, the number of revenue-earning flying hours per year was quoted at 3,000, but any constructor who feels that this figure is too high or too low may calculate costs based upon some other figure provided that he details his reasons for making the departure from the standard. Other averages include a rate of six per cent of the aircraft's first cost (including spares) for insurance (including third party liability), and a £15-per-seat rate for passenger liability.

A study of operating statistics showed that the average cost of airframe maintenance can be fairly represented as proportional to the equipped-airframe weight. The total labour rate (including 200 per cent for workshop overheads) is assumed as being 10s per man-hour. The total hourly cost of 11s per 1,000 lb equipped airframe weight (the equipped weight is defined as "Basically Operational Weight" minus total "Power Weight"—i.e., less engines, airscrews and all power accessories) is then based on the assumption that 0.9 man-hours and 2s worth of materials are expended on maintenance for each 1,000 lb every flying hour.

The formula for estimating maintenance cost of the power plant assumes an average of 0.9 of the permitted interval between major overhauls. Methods for calculating airscrew-maintenance and overhaul and crew-costs are also shown. Fuel assessments are in two categories, the first being the equivalent of the fuel consumed and stage time (to ascertain the cost per flying hour), the second being a calculation of fuel carried (to ascertain the payload for the appropriate stage-length). Cost of oil consumed has been taken as 0.04 of the cost of fuel consumed.

The brochure contains a "worked example" showing the application of the various formulæ and a set of graphs showing cost per flying hour; payload, speed and time; cost per nautical mile, cost per ton nautical mile and passenger nautical mile. A set of definitions designed to remove any ambiguity which might arise in the interpretation of various terms is also included.

Designed principally to apply to piston-engined aircraft, the new method nevertheless offers guidance on certain aspects of turbojet- and turboprop-powered aircraft and, when technical and operational development requires it, the method will be revised to bring them fully within its scope.

BREVITIES

IT is understood that Turkish Airlines have decided to purchase ten British Helicopters for service in remote parts of Eastern Anatolia, where excessive snowfalls render land communications extremely difficult during the winter months.

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It has been announced that Air Marshal Sir Roderick Carr, who has been M.C.A.'s Divisional Director for the London and South East Division during the past three years, is to retire from that position on January 31st.

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According to an article in the November issue of the Glenn L. Martin company's journal, Northwest Airlines are now operating their Martin 2-0-2s at a direct cost of 14.85 cents per available ton-mile. This is said to compare with a direct cost of 18.83 cents for the DC-3. In the two years during which Northwest has used them, the 2-0-2s have flown 12,275,635 revenue miles and 223,255,000 revenue passenger-miles.

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The first certificate authorizing a foreign repair agency to perform work on United States aircraft has been issued by C.A.A. to the Compania Mexicana de Aviacion, an affiliated company of Pan American Airways in Mexico City. Certification of such foreign stations is permitted, under the terms of an amendment to the Civil Air Regulations, if the personnel are deemed competent by the C.A.A. (even though they do not hold licences issued by that authority) and provided that the stations comply with technical requirements identical to those for their U.S. counterparts.

* * *

A total of 2,087 civil aircraft registrations has been reported by the Civil Aviation Division of the Canadian Department of Transport. Of these, 1,468 are commercial aircraft and 619 are privately owned. Licences for airports amount to 369, and the total of personnel licensed includes 4,158 pilots.

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B.O.A.C. has reported that the total of revenue passengers increased by over 12,000 during the first nine months of this year. Cargo carried increased by over 12 per cent, from 2,660 to 2,984 tons, but the total of mail showed a decrease of 7.8 per cent as compared with the same period of last year.

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Air Marshal Sir John d'Albiac, commandant of London Airport, was one of the passengers on the first flight of the B.O.A.C. Stratocruiser service between London and New York which left London on December 6th. It is understood that the purpose of Sir John's visit will be to study the working of the air traffic control and passenger facilities at Idlewild.

CIVIL AVIATION NEWS

Information concerning operations by Ethiopian Airlines, Inc., for the first nine months of the current year reveal a profit of £15,408, as compared with £14,172 for the whole of 1948. The total of revenue passenger-miles flown for the first three quarters of 1949 was 6,440,380—229,425 more than the figure for the whole of last year. Ethiopian Airlines operate a fleet of ten aircraft, nine of which are DC-3s; the other is a Stinson L-5.

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In connection with the British air charter market it is reported that several operators have submitted quotations for the carriage of passengers on inclusive tours between the United Kingdom and various Continental resorts during the holiday season of 1950. Additionally, the possibilities of chartering aircraft to bring regular parties of tourists from the U.S.A. to European destinations are being investigated by travel agencies.

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The Director of Civil Aviation in the American zone of Germany has announced that Germans are being trained for air-traffic duties in the American as well as in the British zone. Forty Germans are said to have been chosen out of 2,000 applicants and their training is now in progress. When qualified they will be detailed for duties in control towers under Allied supervision.

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A three-times-weekly service between New York and Nice was inaugurated on December 2nd by Pan American World Airways. The new direct service, on which Constellations will be used, brings the French Riviera within less than a day of New York. Travellers to Nice this winter can also take advantage of the off-season rates, which are approximately 25 per cent below the year round fares. Sixty-day returns now cost $549, compared with the normal fare of $711.

BONANZA SENIOR: The first photograph of the Beech Twin-Bonanza reveals a new design for an all-metal, 5-seat, light twin for the private or commercial owner. Powered by 260 h.p. Lycoming engines, the first Model 50, as it is designated, made its initial flights on November 15th. A cruising speed of over 180 m.p.h. and a range of 1,000 miles are among the estimated performance figures; six passengers can be carried with shorter-range fuel load. The price is estimated at 30,000 dollars.

FROM THE CLUBS

THE Royal Aero Club of New South Wales held its annual pageant at Bankstown on Saturday, November 26th. Some 25,000 spectators paid for admission, while a further 25,000 watched the excellent flying display from nearby roadsides.

The programme included performances by the R.A.A.F. and R.A.N., and gliders from a nearby club. Highlights of the afternoon were an aerobatic display by a formation of Vampires and simulated deck landings on a special strip on the airport by 14 naval aircraft, whose performance also included a demonstration of JATO technique.

* * *

ALTHOUGH not favoured with a single fine week-end, the Southend Municipal Flying School accumulated a total of 134 hours during November. Three members obtained their Private Pilots' licences, and were all able to take advantage of the Club's recent "approval," each pilot completing his course in approximately 31 hours. Three first solos were also recorded during the month. The flying school will be closed on Christmas Day, but will be in full operation from 9 a.m. on Monday, December 26th.

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DUE to adverse weather throughout November, total flying by the London Aeroplane Club amounted to 48 hr 25 min. One student successfully passed all tests for his Private Pilot's Licence.

With flying thus curtailed, thoughts have naturally turned to the Club's social activities, and it has been decided that the annual dinner and dance will be held on January 20th at the Waterend Barn, St. Albans. The choice of a local *venue* for the party is considered to be more in keeping with the post-war traditions of the Club and will also permit a lower admission fee to be charged. Tickets (25s, exclusive of wine) may be obtained from the Club's secretary, at Panshanger Airfield.

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AT White Waltham on Saturday there was a sequel to last summer's first annual convention of the Association of British Aero Clubs and Centres—when, it will be remembered, 5s contributions to the Association's fighting fund brought the opportunity of acquiring, among other things, one complete Auster Autocrat.

On Saturday, S/L. Ronald Porteous, chief pilot of Auster Aircraft, Ltd., manufacturers and donors of the aircraft, presented the Autocrat's C. of A. to Mr. "Eustace" Miles, chairman of the Association, and Mr. Miles, in turn, awarded the desirable document to Miss Margaret Kelly, a 25-year-old non-flying member of the Liverpool Flying Club. Fortune does not always discriminate, but in this case, it seems, luck was on the right side. Running expenses may prevent Miss Kelly from remaining a full private-owner indefinitely, but long-desired and previously unattainable flying lessons are hers, together with the prospect of many pleasant hours of piloting in the future.

There were a number of firms whose generosity made possible the presentation. Auster Aircraft, Ltd., provided the airframe, and assembly of the complete aircraft; the power unit was given by Cirrus Engine Section of Blackburn and General Aircraft, Ltd.; the Fairey Aviation Company was responsible for the airscrew; the instruments were from Smiths; upholstery by Ernest Turner (London), Ltd.; and wheels, tyres and brakes by Dunlop. Cellon, Ltd., provided the finishing touch in attractive cream and green.

* * *

THE Plymouth and District Aero Club reports a total of 980 hours in the four months from June to September. Even during October and November, with adverse weather and short days, 150 hours were flown. The Club's course of training for the Private Pilot's licence has been inspected by the M.C.A. and approval has been announced. Potential pupils can now take advantage of the ten-hour reduction in flying time required to qualify for the Licence.

For the coming months a series of entertainments, including lectures and film shows, has been organized, the clubhouse newly decorated and more efficient heating arrangements installed.

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SURREY Gliding Club, aided and abetted by Imperial College G.C., who share their site at Redhill, held their annual Christmas party at the club-house on Saturday. The affair was "informal" in the sense understood by gliding enthusiasts—which means very informal indeed, deafeningly noisy and extremely entertaining.

A "Victorian melodrama" metaphorically brought the house down—a process which was nearly completed in the literal sense by later developments; musical contributions ranged from "Doc" Slater's famous tin whistle to a massed band equipped entirely with kitchen utensils; and Instructor Lorne Welch was forcibly presented with a nicely potted "aileron bush" and other tokens of pupilary esteem.

E.T.P.S. CELEBRATES

Annual Dinner and McKenna Trophy Presentation at Farnborough

TO mark the completion of another very successful course at the Empire Test Pilots' School* at Farnborough, the annual dinner and presentation of the McKenna Trophy took place in the Mess on Tuesday, December 6. For several reasons, including a fine summer, it has been one of the most enjoyable years since the School was started. Students achieved the high average of 120 hours' test flying each; all passed out with green instrument-rating tickets; and all were given gliding experience. The highlight of the programme of visits was the flight to the Mediterranean by course and staff to spend several days as guests on the United States Carrier *Coral Sea*.

For the first time the McKenna trophy was won by a non-British pilot, the well-deserved first place going to Lt. Cdr. Joe Smith, U.S.N. Runner-up in what has been called a photo finish was F/L. Harrison, R.A.F. Previous winners of the trophy, each representing a different service, were, in reverse order, Lt. (A) J. Elliott, R.N., S/L. R. W. Whitthome, R.A.F., F/L. Foster, R.C.A.F., and S/L. D. R. Cumming, R.Aus.A.F.

S/L. "Cyclops" Brown, presiding, introduced the Commandant, G/C. L. S. Snaith, who said that it was an honour to have Admiral Mackintosh to present the trophy, for a precedent was being created which, it was hoped, would establish the rule—namely, that a senior officer of the Service holding the trophy would each year present it to the new winner. This year's winner, Lt. Cdr. Smith of the United States Navy, had made history in being the first American to take away from the British Empire one of the few trophies that really mattered. "Joe thoroughly deserves his success," said the Group Captain, "He has worked hard throughout the course. He has earned everybody's goodwill, and I believe that his success was not entirely unexpected." Of F/L. Harrison, who received the runner-up prize, the Commandant said "if ever a man deserved it, he did. He was only beaten by a short head in a most thrilling finish. He put up a great show." The second prize would be a regular feature in future; it was being presented anonymously by a great believer in the course, one who thought that scientific training of pilots was the best insurance we could have against disaster in this highly scientific air age.

The purpose of the School, continued G/C. Snaith, was to train specially selected pilots to a standard that would enable them to participate to the full as members of teams composed of scientific, technical and flying personnel. A priceless advantage of being at Farnborough was the frequent lectures from R.A.E. experts, led by the director himself. In addition, Sir Frank Whittle, Professor Hill, and other well-known authorities had lectured to the course. In flying, the course had concentrated on handling, though not to the neglect of performance. In addition, everybody had made at least fifteen gliding flights and two had achieved the height and distance qualifications for their "silver eagle."

There were some pretty remarkable characters on the course, added the speaker, and one, Lt. Cdr. Bee Weems, had to be mentioned. He (Weems) had decided that he would like to go to the Mediterranean for a cruise. "He did—taking us all with him" said G/C. Snaith. A large framed copy of the School's newly created badge was going to be sent to the United States Carrier *Coral Sea* in appreciation.

Concluding with a tribute to G/C. Sam McKenna, the Group Captain said: "If you have absorbed some of the McKenna tradition then you need have no fear for the future—nor need the aviation world."

Admiral Mackintosh, presenting the trophy, revealed that the next C.F.I. of the E.T.P.S. would be a Naval officer. He recalled his own pleasant associations with the American Navy when he had commanded a carrier in a U.S. Task Force during the war, and he mentioned the complete harmony existing between *Saratoga* and *Victorious*, even to the extent of interchanging aircraft. Congratulating Lt. Cdr. Joe Smith and F/L. Harrison, he added that congratulations were also due to all who had passed the course successfully or had even been worthy of selection. The Admiral enumerated the finest qualities of man, which he said were required of a test pilot.

Lt. Cdr. Smith briefly thanked the Admiral and the Commandant, and said he would remember the year at Farnborough as one of the high points of his Service career. F/L. Harrison thanked "the unknown donor" of the runner-up prize. He said he had had training for the "four writing races of recent weeks" when producing lines at school, a very familiar example of which was (and here he examined the bottom of his newly acquired beer mug) "Empty vessels make most noise."

ALPHABETICAL LIST OF STUDENTS SUCCESSFULLY COMPLETING NO. 8 COURSE.

F/L. B. G. Aston, D.F.C. (R.A.F.); F/L. A. W. Bedford, A.F.C. (R.A.F.); F/L. R. Bradwell, D.F.C. (R.A.F.); F/L. D. W. Butler (R.A.F.); Lt. F. Cawood (R.N.); F/L. C. G. Clark, D.F.C. (R.A.F.); F/L. R. F. W. Cleaver, D.S.O., D.F.C. (R.A.F.); F/L. S. Das (R.I.A.F.); Capt. J. M. Davis (U.S.A.F.); F/L. R. V. Ecclestone, D.F.C. (R.A.F.); F/L. E. D. Glaser, D.F.C. (R.A.F.); F/L. M. W. Grierson-Jackson (R.A.F.); F/L. J. G. Harrison (R.A.F.); F/L. G. K. N. Lloyd (R.A.F.); Lt. R. M. Orr-Ewing (R.N.); F/L. J. H. Phillips, D.F.C. (R.C.A.F.); Lt. C. E. Price (R.N.); F/L. B. Radley (R.A.F.); Lt. J. Robertson (R.N.); F/L. J. A. Rowland, D.F.C. (R.A.A.F.); Lt. Cdr. J. G. Smith (U.S.N.); F/L. R. L. Suri (R.I.A.F.); F/L. E. A. Tennant, D.F.C. (R.A.F.); F/L. B. Warren, D.F.C. (R.C.A.F.); Lt. Cdr. G. T. Weems (U.S.N.); F/L D. White, D.F.C. (R.A.F.); F/L. A. D. Woodcock (R.A.F.).

** An illustrated feature article on the work of the E.T.P.S. appeared in "Flight" of December 1st, 1949.*

PIONEER AUSTRALIA FLIGHT RECALLED

A VERY pleasant dinner was given at the Savoy Hotel last Thursday in honour of Sir Keith and Lady Smith, and in commemoration of the 30th anniversary of the historic first flight to Australia. Proposing the toast of "Sir Keith and Lady Smith," Lt.-Gen. Sir Ronald Weeks, chairman of Vickers, Ltd., spoke of the flight and the men who made it, and paid a tribute to the designers of the aircraft, its engines and its instruments. Sir Ronald recalled that the late Sir Ross Smith was one of only two R.F.C. pilots to receive a triple D.F.C. in the Great War.

Sir Keith is, of course, a leading figure in aviation in Australia. In addition to being (since 1924) Vickers-Armstrongs' chief representative in Australia, he is a director of most of the large airline concerns out there—Qantas, Tasman and British Commonweath Pacific among them.

The Vickers Vimy aircraft used on the flight thirty years ago is now in the Canberra Museum.

Replying to the toast, Sir Keith told a vivid story of the early planning preparations and of experiences on the flight itself. In particular he recalled the co-operation of the Vickers and Rolls-Royce companies, and the test of the aircraft by Sir John Alcock, who, six months earlier, had flown the Atlantic in a similar machine. He recalled that he, the navigator, had personally poured every drop of petrol into the Vimy's 520-gallon tanks through a chamois filter; that 5 cwt of spares were carried; and that from India onwards maps were virtually non-existent—on one stretch Siamese maps of that time, with Siamese characters, had had to be used. On take-off from Calcutta they hit a hawk and damaged an airscrew, putting it so far out of balance that even after its repair the engine driving it was damaged. One of the main worries had been the accuracy required when landing, with no brakes, in small fields. So heavy had been the rain into the open cockpits on one stretch that the aircraft's trim was seriously upset by several inches of water collecting in the tail, and the mechanics had had to knock out some panels to release it.

Major Sir Hew Kilner proposed "The Guests" in a humorous speech, to which a reply was made by Sir Miles Thomas, who said that in the thirty years since the historic first flight we had reached the threshold of jet transportation and had been able to reduce the flying time for the journey by 100 hours and the elapsed time by 25 days. On the Australian route in the year past, B.O.A.C. and Qantas had together carried some 20,000 passengers and 1,400 tons of freight and mail. All this had stemmed from the first flight. He recalled that he had been in Baghdad when Sir Keith and Sir Ross Smith landed there.

To Sgt. Shiers, the surviving mechanic on the flight, now resident in Sydney, a telegram of greetings and good wishes was despatched. Among those closely associated with the flight and present at the dinner were Marshal of the R.A.F. Lord Trenchard and also Mr. Peter Acland, who was at that time Vickers' aviation manager.

A story of the journey appeared in *Flight* last week.

CANBERRA

Design Analysis of Britain's First Jet Bomber

WHEN photographs of the English Electric Canberra were initially released for publication in May, the low-aspect-ratio wing evoked a good deal of interest and speculation. It also came as a comforting relief to many thinking people who had long been somewhat uneasy about the general Gadarene trend toward higher and higher wing loadings. A low aspect ratio is not by any means synonymous with a low wing-loading, but the all-up weight of the Canberra could scarcely be great enough to give, with a wing of that area, a loading anything like so high as that which has now become almost common practice. And so it has since proved.

The origin of the aircraft as a specific design is interesting in that it shows a preoccupation with efficiency, modified only by a sensible, down-to-earth appreciation of practicability. As mentioned in our December 1st issue, the germ of the idea from which the Canberra finally grew first occurred to Mr. Petter in 1944, when he was technical director of Westland Aircraft, Ltd. This, however, was something in the nature of mental "doodling" such as all designers indulge in, and it was not until a specification for a high-performance jet bomber was issued to the English Electric Co., Ltd. (of whose aircraft division Mr. Petter had newly become chief engineer), that the "doodle" had a chance of being developed into something serious.

The specification outlined speed, range, load, cruising altitude and single-engine performance minima, take-off and landing distances and parameters of strength requirements, and stipulated the employment of two Rolls-Royce Avon axial-flow turbojets. Within this framework, Mr. Petter and his team were free to design any aircraft which would fulfil the requirements and embody the ancillary items of the specification, such as a pressure cabin, ejector seats, radio and navigational equipment, the required variety of bomb loads and so forth. The next step was to plot out a large range of alternative design studies, the chief variables of which were wing area and plan form.

In making these studies, there was a constant preoccupation toward keeping something in hand for development, particularly in the matter of increasing range, and as a result the bias was in the direction of low loadings. Examination and analysis of the several factors—for example, the plotting of wing loading and aspect ratio against performance and wing weight for a fixed thrust—clearly indicated an optimum among the (by modern standards) low wing-loadings. This, in turn, permitted a cruising condition at a low C_L which, further, allowed the use of a low aspect-ratio. Structurally, wing thickness was virtually determined by the necessity to stow the main undercarriage wheels, and the choice of aspect ratio was influenced by this required wheel-stowage depth and the aerodynamic factors which set an upper limit to thickness/chord ratio. The decision to use an aspect ratio of 4.3 was eventually taken, the span loading being of a conventional order, i.e., approximating to the value used for a modern fighter with an aspect ratio of about 6.

Incidental advantages accruing from a design of this kind were the attainment of a high degree of manœuvrability, particularly at extreme altitudes, coupled with outstanding low-speed-handling characteristics, the latter being safeguarded by the decision to eschew a high taper ratio. In the event, it has been established that the Canberra virtually sets a new standard among contemporary military types for low-speed handling, approach and landing characteristics. The stall, in particular, is gentle, straightforward and utterly viceless, and the speed range of the aircraft is believed to be wider than that of any other known fixed-wing type: it is, in point of fact, something over 7:1.

A symmetrical aerofoil section is employed for the mainplanes as a means of avoiding violent pitch-changes when the critical Mach number is exceeded. The actual section used (a modification of a German contour) was designed to give a reasonably high critical Mach number without sacrifice of good control characteristics. It is essentially a matter of compromise between the opposing desiderata of having the maximum thickness sufficiently far back to give good M_{CRIT} yet sufficiently far forward to give good control. Help is given in regard to the latter quality by designing the section with a narrow trailing-edge angle. In this connection, the control surfaces are flat-faced "wedges" and if any aerodynamic penalty has to be paid for lack of chordal curvature, it is so small as to be negligible; additionally, it is of small moment in relation to the advantages that such surfaces permit in the achievement of a high standard of inspection during manufacture. They are, furthermore, very much easier to produce.

CANBERRA . . .

In deciding upon a mid-wing and mid-nacelle position, the aim (structural considerations aside) was to achieve a minimum overall drag and, at the same time, to ensure the least unpleasantness of behaviour at speeds above the critical Mach number. The entire absence of fairing fillets is a remarkable feature of the Canberra, but the view taken by the design team is that, if properly done, an intersection relationship such as that used does not require fillets. The general tenor of feeling on this subject as expressed during our visit to Warton can, perhaps, best be summed up as a view that in many instances the use of fillets is verging on habit and is thus a compromise with inefficiency. This contention is at least justified by the Canberra in that the aircraft has a demonstrably lower low-speed C_D than any other orthodox contemporary type. The flow form around the aircraft must certainly be reasonably free from violent disruption, and the "mid-positioning" also seems to pay dividends, for the critical Mach number of the wing has been very considerably exceeded in flight without the usual concomitant pitch change.

For the same reasons of mitigating the likelihood of pitch change, a relatively low aspect-ratio was deliberately chosen for the tailplane and, in fact, the characteristics of the tailplane are such that the aircraft is completely stable for all conditions of altitude and c.g. position—within, of course, the respective limits of performance and travel. Dihedral was adopted primarily to give clearance from jet-exhaust influence, but an incidental dividend is that the asymmetrical tail load is reduced during single-engine flight. The requirements for single-engine flight also governed the design of the fin and rudder. All control surfaces have spring tabs and a degree of aerodynamic balance and all are mass-balanced.

In contrast to the low-aspect-ratio wing, the Canberra fuselage gives the appearance of being inordinately slim—although, in point of fact, the diameter of the central trunk portion is no less than 6ft. A circular section obtains throughout, this having been adopted primarily from considerations of cabin pressurization. As already noted, the central fuselage trunk is a parallel cylinder; forward of this, the front fuselage is formed as a symmetrical ellipsoid in that, although a circular section is maintained, the major axis of the body is inclined downward—by this means, the pilot's field of view is considerably enhanced. A circular section is also maintained throughout the length of the rear fuselage, but the axis of this body is actually a large-radius curve, so that the "ridge" line of the rear fuselage is a straight continuation of that of the centre fuselage, and the "keel" line curves up in a graceful sweep to the tail cap, so affording ground clearance in the event of an unduly tail-down landing.

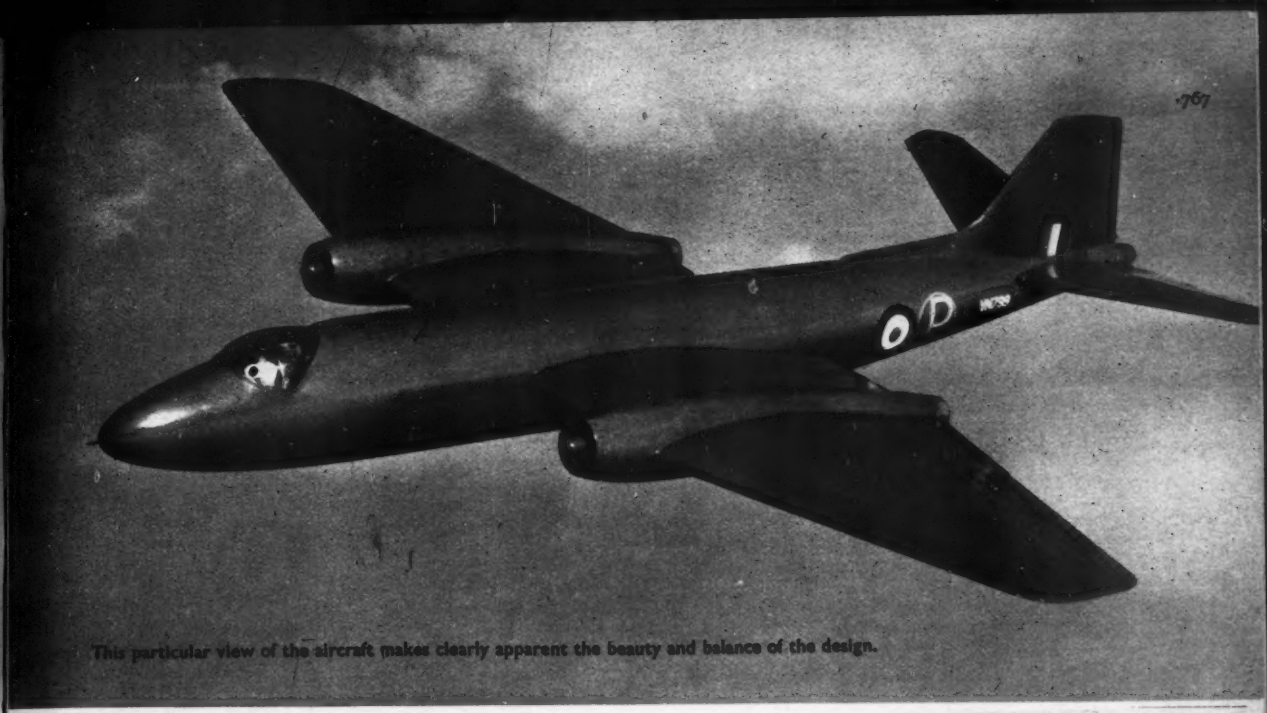
The foregoing is a précis of the design fundamentals of the Canberra as a flying machine, and it is perhaps appropriate at this point to mention that the aerodynamic quality was initially checked in the high-speed tunnel at Farnborough prior to the extensive and extremely thorough tunnel-work subsequently undertaken in the company's own 9ft by 7ft tunnel at Warton (*Flight*, November 17th, 1949). Before going on to review the "interior economy" and structure of the aircraft, it will be apposite to digress for a moment and make a quick survey of the production aspects.

Among British aircraft manufacturers, the English Electric Co., Ltd., is unique: diesel engines, electrical equipment of all kinds, locomotives, domestic appliances such as electric stoves and washing machines, fires and radiators, are, with aircraft, things which the company manufacture. In visualizing this fact, it should not be thought that undue emphasis is placed on the activities of the aircraft division; on the contrary, we gained the impression during our visit that, so far as the company *per se* is concerned, aircraft are just another commodity. This, to us, was somewhat astonishing; but the fact that the company had, in the Canberra, succeeded in building an aircraft which, from all points of view, must be assessed as a superlative machine, is not in itself so surprising when one considers (a) the quality of the design team, and (b) the magnificent record of the company in building Hampdens and Halifaxes during the war, and Vampires since.

The aircraft division is also, if not unique, at least unusual in having no experimental shop, and in this connection, the first Canberra was not a prototype in the normally understood sense of the term. The reasoning behind the company's method is that, if the finished aircraft is to perform with any close adherence to the designer's intention, it is essential that the structure should be accurate. For this reason, even the first aircraft was jig-built. Certainly, the pre-production jigs are designed for a limited application—they are, in fact, good for perhaps the first twenty aircraft—but even so, they fully serve their purpose and, furthermore, provide useful data for the final production jigs, to which, as work progresses, they are giving way.

Pre-requisites for such a policy are certainty of design, and integration of performance and production demands, the latter quality being essentially a matter of harmonious working relationship between the design and production staffs. In this connection, the success of the Canberra must be attributed to Mr. A. Sheffield, O.B.E. (general manager, Preston), Mr. W. Shorrock, M.B.E. (assistant works manager, Preston), and Mr. R. N. Hollock, B.Sc. (aircraft superintendent, Preston), as much as to Mr. Petter,

The neatness and cleanliness of the Canberra makes it appear a good deal smaller than it is. "Flight" photograph.



This particular view of the aircraft makes clearly apparent the beauty and balance of the design.

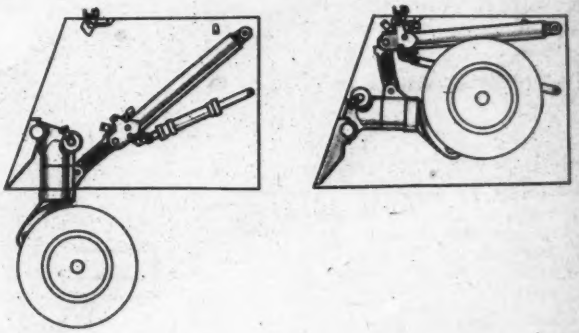
his chief of production design, Mr. H. C. Harrison, A.M.I.Mech.E., A.F.R.Ae.S., and the rest of the team.

In interior layout, the aircraft achieves a standard comparable with that of its performance; than which, perhaps, no more need be said in the way of comment. Removal of the nose-cap—to which the pressure head forms a proboscis—gives direct access to the rudder pedal assembly and the back of the pilot's instrument panels. The pilot's seat is carried on a small sub-floor, built above the general cabin floor level and is offset 6in to port from the fuselage axis: the seat itself is of Martin-Baker ejector type.

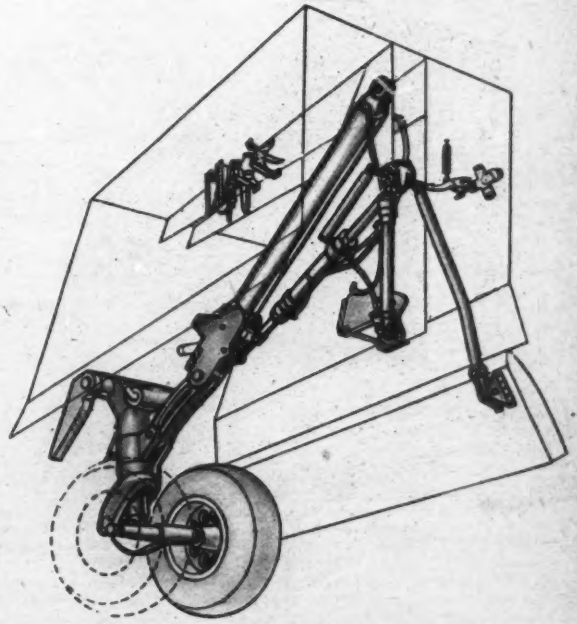
One of the Canberra's singular features is the pilot's canopy, a double Perspex dome, the $\frac{5}{16}$in thick outer skin of which is separated from the $\frac{3}{16}$in inner skin by a $\frac{1}{2}$in cavity aspirated through twin packs of activated alumina desiccant. The canopy, which has a base width of 4ft 6in and a fore-to-aft length of 4ft 10in, is anchored to a foundation tube by means of explosive bolts whereby, in the event of emergency, it can be jettisoned: it also embodies a pair of submerged aerials which, on the port and starboard beams, run upward from the base skirt to a zenithal angle of about 50 deg. The profile of the canopy is such that it is only about 12in away from the pilot's eyes, and at roughly 45 deg on the port bow it incorporates a 6in-diameter door (rather like that of a miniature safe) which, when opened, permits direct vision to be obtained: additionally, immediately ahead of the pilot's face is mounted a small two-ply glass screen to act as a wind-deflector and so give some measure of protection to the pilot between the time of jettisoning the hood and jettisoning himself.

The cockpit layout is excellent. Having climbed up through the entry floor in the starboard flank of the nose, and settled oneself in the pilot's seat, the generous amount of space and the workmanlike arrangement of everything becomes genuinely apparent. To the left of the blind-flying panel, immediately forward of the spectacle-headed control column, is a machmeter, whilst the engine instruments are grouped on the right in a panel raked at between 10 and 15 deg, so as to reduce parallax: auxiliary service instruments are carried to the right of the engine instruments. Beneath the blind-flying panel is the tailplane-incidence control and indicator, together with the main engine-switches, whilst the throttles and fuel cocks are positioned at the forward end of an inclined shelf to the left of the seat, together with the several switches for flap operation, rudder trim, bomb-door operation, hood jettison and control-column release. Actuator buttons for the Graviner fire-suppression system are fitted above the engine-instrument panel.

Behind the pilot, but on the centre-line of the aircraft, is the navigator's station—also furnished with an M-B.



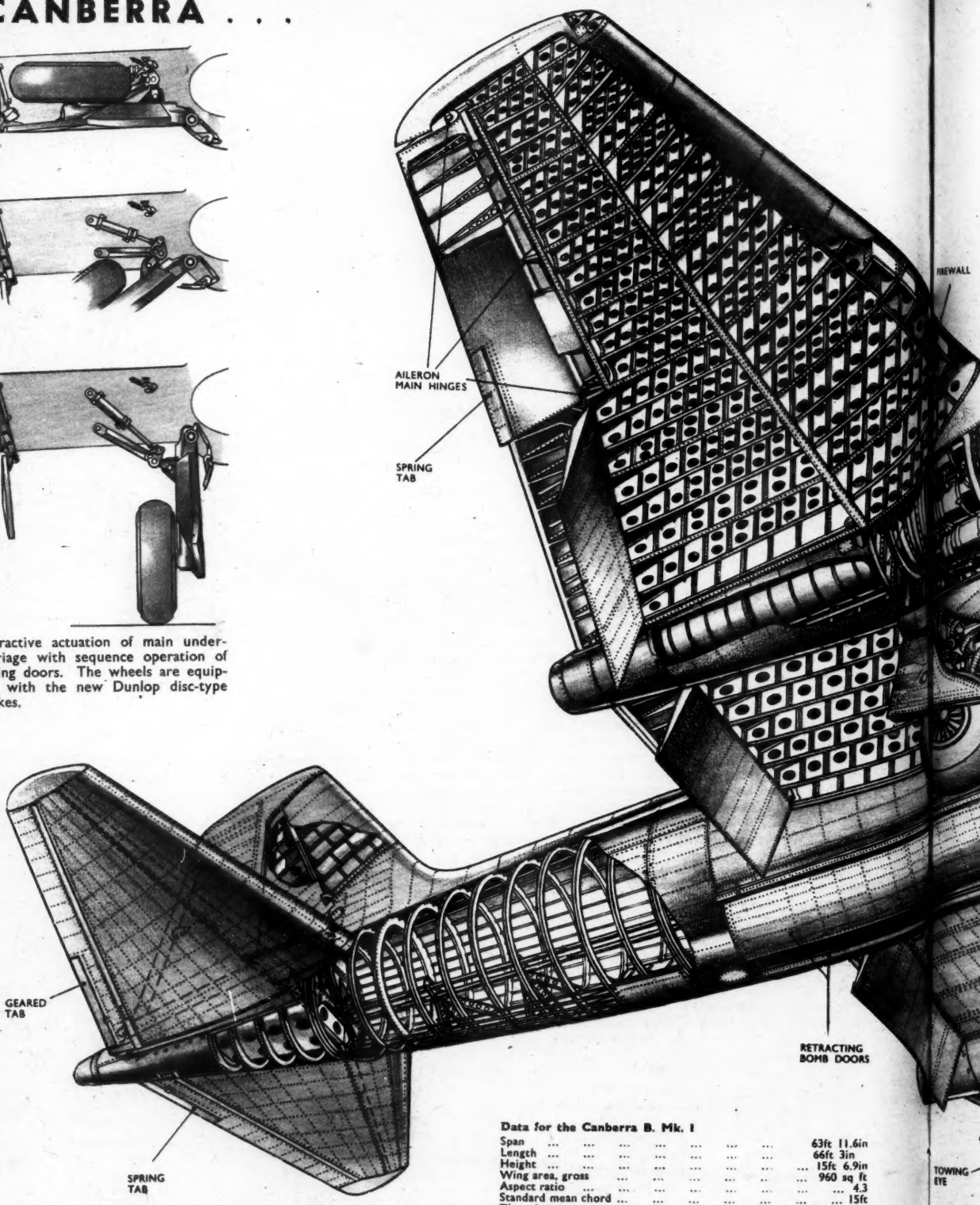
Retraction geometry of the nosewheel assembly.



Sketch detail of nosewheel assembly construction.

CANBERRA . . .

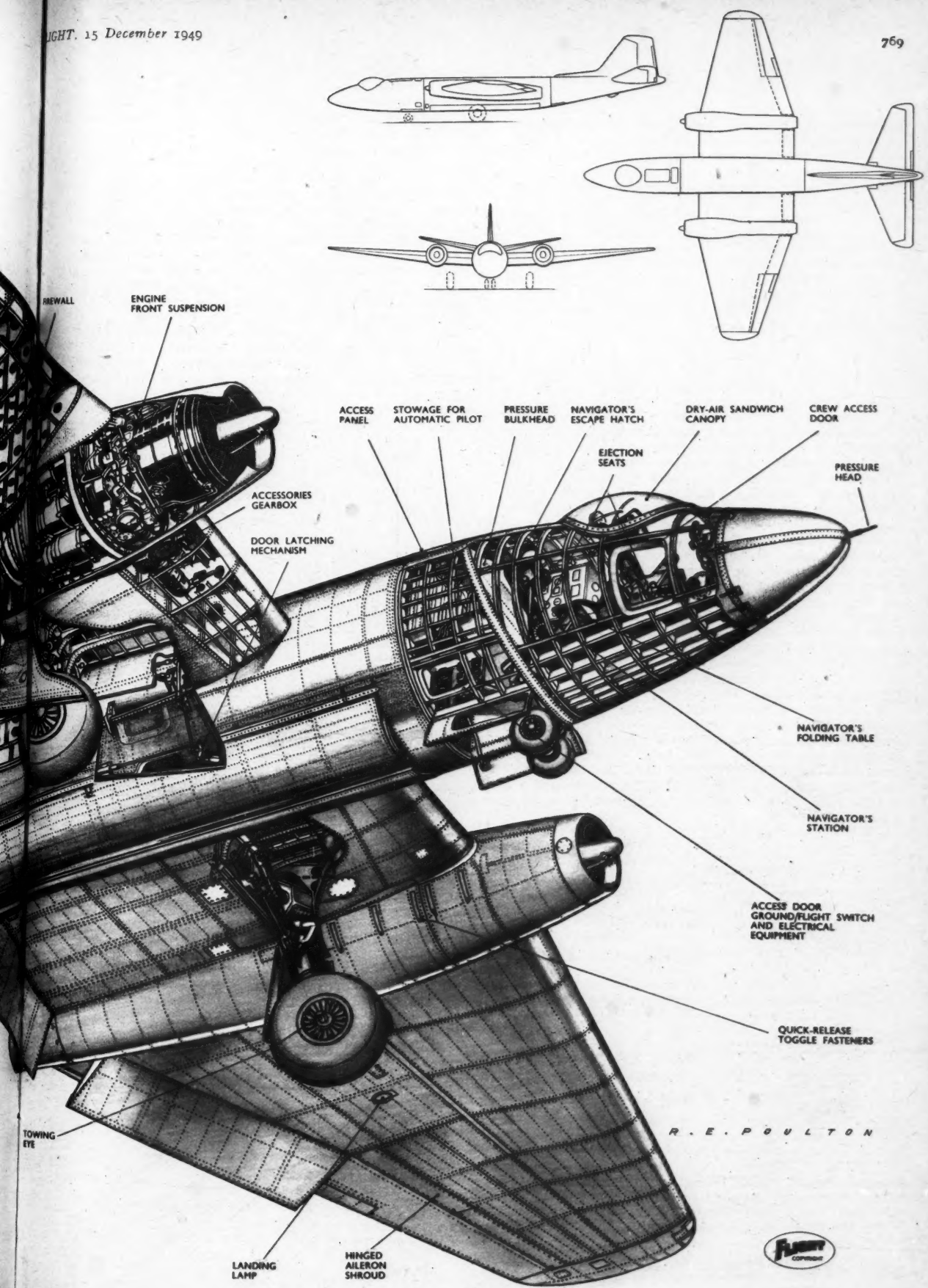
Retractive actuation of main undercarriage with sequence operation of fairing doors. The wheels are equipped with the new Dunlop disc-type brakes.



In taking this somewhat unusual viewpoint from which to illustrate the Canberra, *Flight's* artist was concerned with making the drawing as informative as possible within the limits imposed by security. The size of the bomb doors, the compact installation of the Rolls-Royce Avons, the generous cockpit accommodation and the excellent maintenance facilities of this most interesting aircraft are readily apparent.

Data for the Canberra B. Mk. I

Span	63ft 11.6in
Length	66ft 3in
Height	15ft 6.9in
Wing area, gross	960 sq ft
Aspect ratio	4.3
Standard mean chord	15ft
T/c ratio : root	12 per cent.
tip	9 per cent.
Dihedral : inner wing	2 deg.
outer wing	4 deg. 21 min.
Incidence	2 deg.
Tailplane span	27ft 4.9in
T/p and elevator area, gross	171.1 sq ft
T/p dihedral on chord plane	10 deg.
T/p incidence : normal	+ 1 deg.
range	+ deg. 52 min. to — 3 deg. 52 min.
Fin and rudder area, gross	71.22ft


FIREWALL
ENGINE FRONT SUSPENSION
ACCESS PANEL
STOWAGE FOR AUTOMATIC PILOT
PRESSURE BULKHEAD
NAVIGATOR'S ESCAPE HATCH
DRY-AIR SANDWICH CANOPY
CREW ACCESS DOOR
EJECTION SEATS
PRESSURE HEAD
ACCESSORIES GEARBOX
DOOR LATCHING MECHANISM
NAVIGATOR'S FOLDING TABLE
NAVIGATOR'S STATION
ACCESS DOOR GROUND/FLIGHT SWITCH AND ELECTRICAL EQUIPMENT
QUICK-RELEASE TOGGLE FASTENERS
TOWING EYE
LANDING LAMP
HINGED AILERON SHROUD
R. E. POULTON

CANBERRA . . .

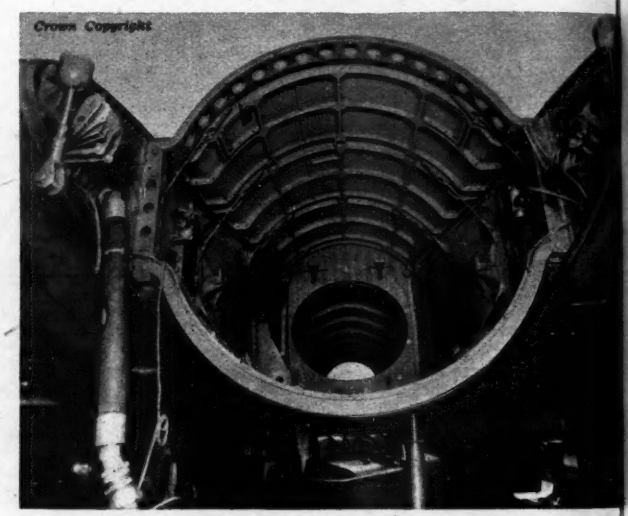
ejector seat. To complement the latter the fuselage roof above the seat is arranged as a jettison escape-hatch, and, to provide the navigator with direct light, the hatch incorporates a circular panel of Perspex. In order to give the requisite clearance in ejection, the bulkhead upon which the navigator's seat is carried slopes backward roughly 20 deg. This bulkhead is the rear diaphragm of the pressure cabin and, for this reason, plus the fact that it is required to carry some of the seat loads (and, too, to function as an anchorage for the nosewheel strut), it is heavily grid-stabilized on its after face. Approximately 21in rearward from the top of the pressure bulkhead is the transport joint between the front and centre fuselage sections, the joint being in a plane normal to the fuselage axis, and closed with a bulkhead. Between this last and the pressure diaphragm is the nosewheel well, the fuselage being horizontally divided by a decking which forms the well roof.

The nosewheel assembly—which, in common with the majority of the hydraulic components used in the aircraft, is by Dowty Equipment (although the hydraulic pumps are Lockheed Mk. 6 units)—has its strut pivoted in a pair of forged brackets bolted on the rear face of the pressure bulkhead, the radius strut and jack head being anchored on the front face of the transport-joint bulkhead, so that the nosewheel retracts rearward. Above the wheel well is stowage space for oxygen bottles, the hydraulic system reservoir and the master unit of the autopilot; this last is, however, not fitted as yet. On each side of the wheel well are useful stowage volumes, that on the starboard side affording accommodation for the ground/flight switch, the ground-supply socket, voltage regulators and so forth, whilst the complementary port compartment is given over to V.H.F. equipment, the Vokes hydraulic filter, the air bottle and pressurization silencer; in addition, access is here given to the flying-control transmission linkage. Access to the three stowage compartments surrounding the nosewheel well is through hatches in the roof and in the port and starboard flanks.

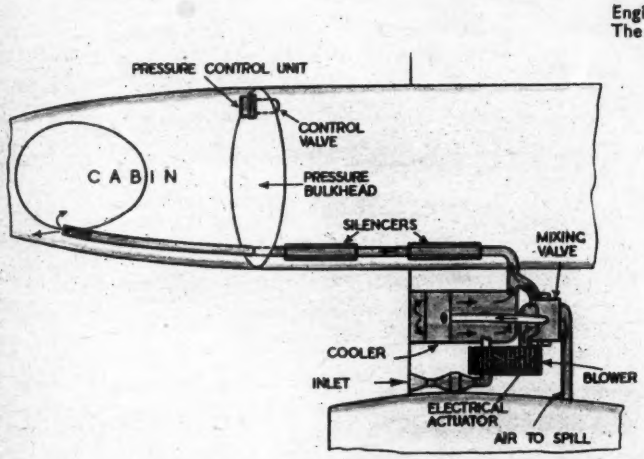
Another stowage compartment—for the accumulators—is embodied in the space between the transport-joint bulkhead and the forward wall of the bomb bay. The batteries are carried on roller trays, whereby easy installation and removal are facilitated through the access door on the port side. The bomb doors are 22ft 3in long and are so arranged that, to open, they retract upward instead of swinging down. At each end of both doors is bolted a forged bracket, centrally pivoted to the fuselage; vertically mounted jacks at each end contract to open the doors, each jack-rod being pin-jointed to a pair of radius struts, the heels of which are, in turn, pin-jointed to the inboard ends of the bomb-door pivot-brackets. Thus, as the jacks close, the doors are raised, each being supported in three roller guide tracks, one at each end and one in the centre.

The bomb-bay roof is, somewhat naturally, a massive structure, and is built up on thwartships beams of plate webs with extruded L-booms, to which fore/aft intercostal channel beams mate to form a grid skeleton carrying the floor plating of the tank cells. Tankage capacity is not extended to the full volume of the bomb-bay attic, and, as the tanks themselves are bag-type crash-proof units by Fireproof Tanks, Ltd., the inner surfaces of the cells are skinned on the free flanges of the fuselage frames.

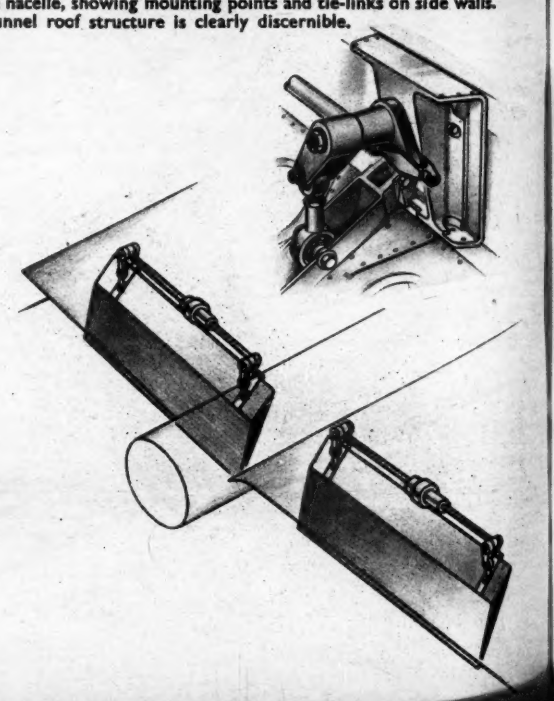
About 27in aft of the bomb-door trailing-edges is the transport joint to the rear fuselage. The latter is a plain, semi-monocoque structure, the channel frames of which are notched for the extruded Z-stringers. In way of the empennage, however, the channel frames give way to pear-shaped semi-diaphragm frames, to which the fin-posts are attached. The extreme tail of the fuselage is formed with a flat deck-



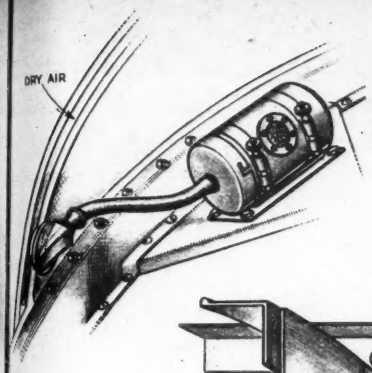
Engine nacelle, showing mounting points and tie-links on side walls. The tunnel roof structure is clearly discernible.



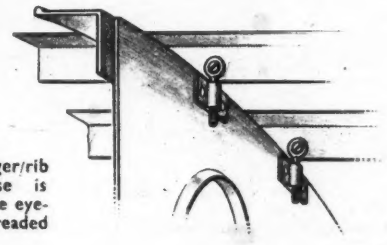
Schematic diagram of cabin pressurization system, showing flow-paths. The type of cooler used is novel in that ambient air is used as the coolant, the blower air being passed through passages adjacent to the leading-edge skin, which itself forms the cooling surface.



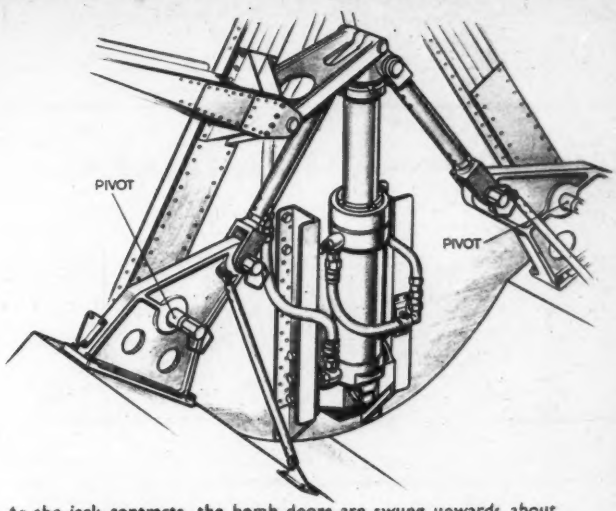
(Right) Detail of bell-crank in flap transmission-linkage and, below it, transmission layout for the (port) flaps.



Arrangement of desiccant pack of activated alumina for the canopy cavity.



Detail of stringer/rib attachment: use is made of miniature eye-bolts and threaded anchor-cleats.



As the jack contracts, the bomb doors are swung upwards about the pivot points to retract into the fuselage.

ing, across which passes the tailplane. This is anchored in pin-joints to the after face of the rearmost pear-frame, and inside the tailplane centre-section is housed an English Electric linear actuator, the head of which is pin-jointed in a saddle bracket on the tailplane top surface, whilst the foot is pin-jointed to an anchorage on the fuselage tail decking. From the latter point, a bracing strut slopes upward through the tailplane to an attachment point on the neck of the rearmost pear-frame.

The tailplane itself is built on a trapezoidal centre-section, the front wall of which is a massive D.T.D. 683 light-alloy casting uniting the spars, the tailplane pivot points being at the forward lower corners of the spar bridge in the form of pin-joint fork/lug fittings bolted to the pear-frame. The tailplane spars are basically similar to those used in the mainplanes in that, in conjunction with plate webs, they employ extruded booms taper-machined spanwise. Chordal ribs of plate webs with extruded beaded-angle booms are set normal to the spars and are notched for the extruded beaded-angle stringers: skin panelling forward of the spars is, like that of the wings, in single sheet wrappings. The elevator is built up on a 10-gauge rolled horseshoe-section spar in conjunction with pressed channel ribs carrying the skin plating. At their root ends, the elevator spars embody torque-transfer fittings flange-riveted to vertical arms, the upper ends of which are joined by a swing link; by this means, the effect of dihedral on elevator motion is compensated. The port elevator is fitted with a spring tab, whilst its starboard fellow has a conventional balance tab.

Although an orthodox spar-and-rib fabrication is employed for the fin, it is unusual in that it is made of wood; the reason is that, as in the case of the pilot's canopy, submerged aerials are embodied in the structure. The rudder is skinned on pressed-sheet chordal ribs and, against the front face of its spar, carries the torsion tube and bar assembly serving the spring tab.

Structurally, the Canberra wing is essentially of monospar form, in that the complementary rear member is of an auxiliary nature and is fashioned in three separate sections, port and starboard, the outermost sections being in way of the ailerons and fitted with a curved web to form the shroud wall. As already noted, the Canberra does not employ a conventional centre-section and the wing spars are joined by a bridge member spanning the fuselage, the connection being made in fork/lug fashion direct to the boom ends with double horizontal pins, top and bottom. The wing structure inboard of the nacelles and forward of the spars is essentially a faired stowage box for various auxiliaries and the main undercarriage, and is divided spanwise by a diaphragm forming the forward wall of the wheel-well, the well itself being roofed by built-up box ribs. Drive from each Avon is given to a Rotol/Rolls-Royce auxiliary gearbox, mounted in each leading edge, that on the starboard side being furnished with a generator, Lockheed Mk 6 pump and Hymatic compressor, whilst, on the port side, in addition to the generator and hydraulic pump, a Marshall cabin blower (5 lb/minute) is carried in place of the Hymatic compressor. As may be seen in the schematic detail sketch, the mixing valve and cooler for the cabin conditioning system are also embodied in the port leading edge.

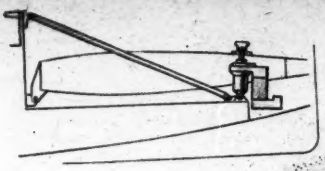
In conjunction with the main spar, at the outboard rear corner of the front part of the inner wing is fitted the massive forged (D.T.D. 683) triangulated anchorage for undercarriage mounting. The undercarriage leg and the head of the radius strut are pivoted in a triangulated machined-bracket bolted to the main-spar web. The main undercarriage, including the oleo units, is of English Electric design and manufacture, the head of the leg being carried at such an angle that, in retracting, the wheel is lifted with a forward swing to enter the leading-edge well. The breaker strut is attached to the leg through an intermediate link incorporating a latch lock and, owing to the geometry of motion, the pivotal points of the jack and radius strut necessitate spherical joints. The undercarriage doors are actuated by a separate jack through sequence valves, and embody toggle-operated positive latch-locking.

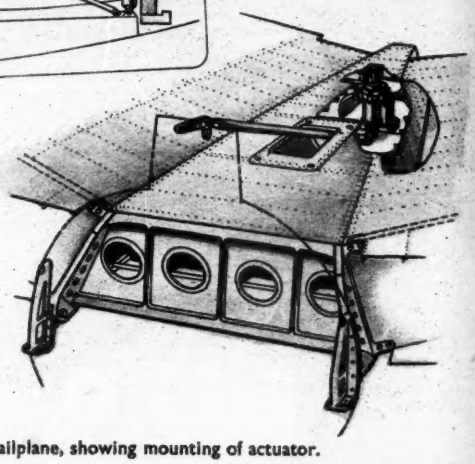
As well as diverging from current practice in loading and aspect ratio, the Canberra wing is also somewhat unusual in structure. For example, forward of the spar in the outer wing panels, the leading edge structure comprises main ribs with plate webs and extruded booms, flanked on each side by sub-ribs similar in form but dimensionally smaller. Intercostal to the main ribs, and over the sub-ribs, run extruded stringers stabilizing the skin. All these ribs are normal to the leading-edge line, and the skin plating is comprised in eight single-wrapping panels. The manner of attaching stringers to the sub-rib booms is extremely clever and is, in fact, the subject of a company patent; it comprises a miniature eye-bolt, pivoted to the stringer web and screwed to a small anchor cleat, riveted to the rib.

Between the main spar and the auxiliary sub-spar, the main chordal ribs have plate webs and extruded T-booms, and are flanked by secondary ribs of flanged plate through which pass the extruded beaded-angle stringers which run intercostal to the main ribs. The spanwise skin-joints are made at three beaded-T extruded skin-attachment stringers which run from the outboard rib of the engine out to the wing tip.

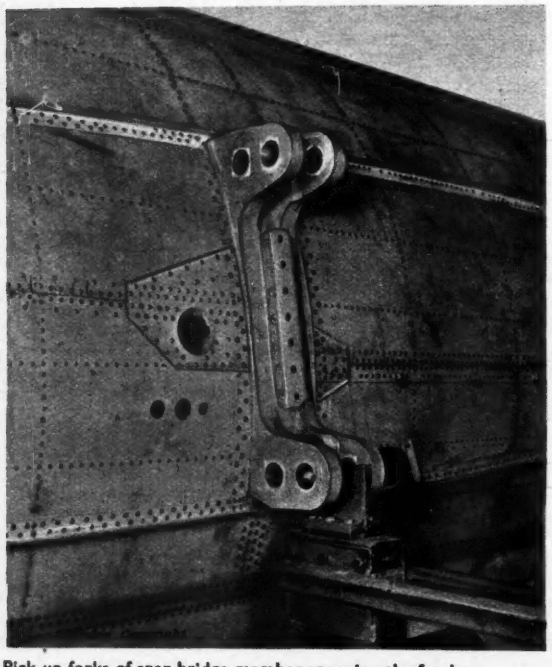
So compact is the Avon turbojet, even by normal "axial" standards, that it is entirely housed forward of the main spar; the cut-out in the spar web to accommodate the jet pipe necessarily has to be compensated, so use is made of massive, cast bridging-rings—again of D.T.D. 683—through-bolted on the front and rear face of the spar. The engine-well is bounded by reinforced leading-edge ribs embodying forged, spherical seatings for the main mounting spigots. Front attachment is effected through swing-link tie-rods depending from hemispherical cup-fittings and pivoted to a truss beneath the compressor casing. This arrangement permits lateral and axial expansion movement

CANBERRA . . .





Detail of tailplane, showing mounting of actuator.



Pick-up forks of spar bridge-member spanning the fuselage.

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Port wing-tip detail showing hinged aileron-shrc

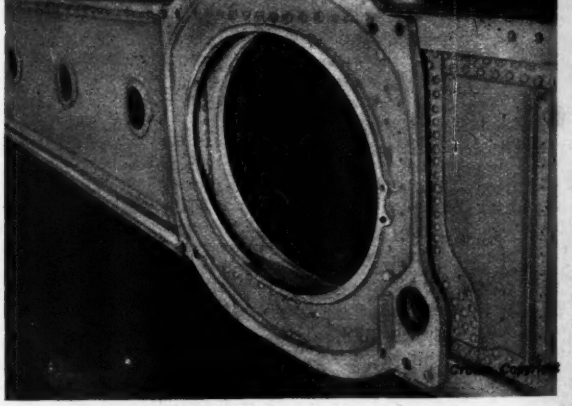
of the engine forward of the main mounting points, axial expansion rearward being accommodated in the jet-pipe tunnel.

Inter-spar ribs similarly bound the jet-pipe tunnel and are stabilized by a series of vertical channel-section members. Elbows at the head and foot of these stabilizing members serve to anchor the spanwise beams carrying the roof and floor of the tunnel. At the sub-spar, the jet pipe passes through the core of an I-section annular casting bridging the spar, from which point, down to the orifice, the jet pipe is shrouded by a semi-monocoque tunnel.

Both inner-wing and outer-wing trailing edges are single-skinned on pressed-sheet wedge-ribs over the retraction recess for the split flaps. The flaps themselves are scalene-section units, skinned on pressed-sheet ribs, the upper surfaces being liberally pierced with flanged lightening holes. Each flap is actuated by an individual jack, set spanwise along the rear face of the sub-spar with no mechanical inter-connection in the system; it is, however, possible that future aircraft may embody flow-dividers in the hydraulic circuit serving the flaps.

An unusual system has been adopted for aileron shrouding. The shroud surfaces are of wedge section with the feather edge *forward*, this being piano-hinged to the sub-spar booms, and the shroud gap adjusted by shims under the stops of the adjustment points at each end and in the centre. This policy was adopted with the conviction that the effectiveness of the ailerons is, in large measure, dependent upon the quality of the shrouding; as an extension of the policy, the shrouds are jig-built. The nose balance of the ailerons is of Westland-Irving type but, whereas in the past, the practice has been to use a flexible diaphragm between the nose "spine" and the shroud wall, this has been dispensed with on the Canberra and, instead, the clearance between the curved sub-spar web and the leading edge of the balance spine has been reduced to something of the order of $\frac{1}{16}$in.

C. B. B-W.



Above, the massive D.T.D. 683 spar-rings bridging the jet pipe and, below, detail of spar-root showing boom machining and bushed holes for the attachment points.

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B.O.A.C.'s Maintenance Organization

Is There a Missing Link?

IT is to be regretted that in his notable paper before the Royal Aeronautical Society in September, 1948, Mr. Peter Masefield did not devote more of his time and space to the very important bearing which maintenance plays in the economics of civil aviation.

He carried out a very thorough survey of operating costs under the two sub-headings "present trends" and "future possibilities," but for some reason or other avoided any comprehensive handling of what is most certainly one of the major contributions to the airline operators' costs—maintenance and overhaul. This is all the more to be regretted in view of the fact that Mr. Masefield's very detailed paper may well become something of a standard work of reference for use by present and future airline operators.

In our nationalized civil airlines during 1948/49 the percentage of the total expenditure absorbed under the heading "Maintenance and Overhaul" was, in the case of B.E.A. 18.48 per cent, and in that of B.O.A.C. 21.95 per cent. At least one quarter of the personnel employed by each of the two Corporations were directly concerned in the maintenance and overhaul of the aircraft, engines and accessories.

THOUGH the views expressed in this article are the personal opinions of the author, we have heard similar sentiments voiced elsewhere and feel that the matter—the higher organization of the B.O.A.C. maintenance services—is one that calls for discussion. The writer is an engineer who has held a number of responsible posts in airline maintenance work

The standard of maintenance in British civil aviation is the best in the world and has been very carefully built up and, where necessary, modified to suit modern needs, since the early days of Imperial Airways. Long experience, coupled with an up-to-date knowledge of modern technique, has produced a type of engineer which is second to none.

It is, however, an unfortunate fact that few of to-day's leaders in civil aviation appear to have a full appreciation of the attitude of the engineers to the job, nor would it seem that they have a full appreciation of the vitally important role which engineering plays in maintaining the very high standard enjoyed by British aviation.

Experience over the last few years, when the industry has been flooded with enthusiastic but amateur technicians from the Royal Air Force, has shown that only the best can make the grade, and that only those who have sufficient tenacity of purpose succeed in making a successful career of aeronautical engineering. But people in authority must realize that an engineer remains always an engineer, and that, although he can easily master the comparative simplicities of traffic handling and operations control, his heart remains in engineering. Exactly the same applies, of course, to the flying crews.

Organizational Gaps

It is regrettable that the recently published Higher Organization Plan of B.O.A.C. [*Flight*, November 10th] does not include a Chief Engineer as the head of the Engineering Department. Though an appointment labelled "Chief Engineer (Operations)" has been made, the organization chart indicates that he is responsible to the Operations Director, and through him to one of the Deputy Chairmen. In addition, there appears little or no connecting link between the Chief Engineer (Operations) and the Engineer Superintendents at the various Line Bases.

The psychological effect of this absence of nominated and clear-cut leadership for such a vital department can result only in impaired efficiency. Every man works better if he is efficiently led, and every man prefers to know exactly who his leader is. The Engineering Department must have a Chief Engineer, and it is courting chaos to have senior engineers answerable to non-technical superiors. The non-technical man is naturally out of phase with experienced engineers.

To this must be added the point that, in accordance with the high standard laid down by our civil air authorities, an airline operator carrying passengers on scheduled services must maintain an inspection organization conforming to certain standards laid down in the British Civil Airworthiness Requirements. The mainstay of the inspection organization is the Chief Inspector, directly responsible to the Directors. If an operator does not have such an organization he must rely for the certification of his aircraft before service on the licensed engineer. B.O.A.C.'s organization does not include a Chief Inspector, so that it would appear likely that the status of the licensed engineer will be further enhanced when those holding the necessary licences will be required to certify the aircraft, engines and accessories as fit for service before the commencement of each flight.

It is obvious that airline operation is divided into four clear-cut departments:—

(1) (a) *Engineering*, who maintain and overhaul the aircraft and make them available for service.
(b) *Inspection*, who ensure the highest standards.
(2) *Operations*, who provide the crews to fly the aircraft.
(3) *Commercial*, who provide the loads.
(4) *Accounts*, who handle the paper-work and collect the money.

All the other sections which make up the whole are, and must be, subsidiary to these four: each of the departments must of necessity have an experiencend and knowledgeable leader responsible only to the General Manager.

B.O.A.C.'s higher organization appears to be severely overloaded as regards subsidiary departments, sections and functions, and one is prompted to conclude that those responsible for its being have little airline operating experience and have shown a surprising lack of ordinary commercial business acumen.

Part of the organization must be considered as a direct reflection on the aircraft constructors. We have, unhappily, not yet reached the stage when an aircraft builder must sell his products on the open market in the face of keen opposition. Many constructors are still producing aircraft to specifications laid down for them by the Ministry of Supply under contracts drawn up on a cost-plus basis. The unfortunate result in some cases, has been that insufficient pre-operational development has been carried out before the aircraft were handed over to the operators. In self-defence the operators have built up an expensive organization, under the heading of Technical Development, to collect operational and maintenance data which is available for the constructors, but only if they feel inclined to make use of it. The present unsatisfactory tie-up between the Ministry of Supply, the constructors and the operators results in much of this very valuable and useful data being ignored.

Technical Development should be a responsibility of the aircraft, engine and accessory constructors, and it appears wrong to permit the operator to burden the taxpayer with this non-revenue-earning function.

One cannot help but feel that in B.O.A.C.'s higher organization the essentials have been missed, and that the good, sound and experienced "core" of the Corporation has been covered by a thick "upper crust" which is decorative but nothing else. In all industries there are various hives of activity, and we know that while the occupants of some hives are not interested in anything but getting on with the job, those in others are more interested in self-advancement, and in spending a great deal of their time scheming and manœuvring for position. When these drones gain control, a form of dry rot sets in which invariably results in inefficiency and ultimate bankruptcy.

MODEL-MAKERS MAKE MERRY

THE encouragement given by Hawker Aircraft, Ltd., to the Northern Heights Model Flying Club—each year the firm places Langley Airfield at the club's disposal for its gala meeting—was again in evidence at the annual dinner-dance and prize-giving, held in London last Thursday. Mr. T. D. Robertson, Hawker's general manager, was among the evening's speakers, and two of the company's test pilots, Neville Duke and "Doc" Morrell, were also present.

Halton—where many of the apprentices are keen aeromodellers—was also well represented by A. Cdre. North Carter (the Commandant), G/C. Rutter—Mrs. Rutter presented the prizes—and W/Cdr. Biggs.

Under the chairmanship of the irrepressible Dr. A. P. Thurston the evening went with a swing, the prize-giving culminating in the award of a 3ft-square "line-shooter's prize" to ex-glider-pilot Geoff Moss; ten minutes' unpacking of successively smaller boxes eventually disclosed (as we suspected) a tin toy aeroplane. A film of club activities, made and screened by J. B. Cox, surpassed professional newsreel standards.

COLLECTING a STRATOCRUISER

PART III : Seattle to New York : Impressions in the Air : A Change of Airscrews : The Flight Home

By the EDITOR

FEW of us, pilots or non-pilots, can remain immune from the thrill, momentarily breath-taking, that accompanies the roar and thrust of engines as an airliner accelerates down the runway and one tenses to the crescendo of noise and throbbing as the throttles approach their stops. It is forgotten immediately as one surrenders to the movement, and the senses change their focus to try to detect the instant of take-off. Not until the earth is falling away does the noise again obtrude, this time to contrast the frenzy of take-off with the almost physical relief which one shares with the engines now purring on the climb. So it was with our Stratocruiser as it raced between the lines of white lights marking the runway at Seattle and, lifting imperceptibly off its wheels—first the main wheels, then the nosewheel—started to climb before circling the city and setting course for the east.

Caledonia's first take-off in the hands of a B.O.A.C. crew—for there is no acceptance test—was smooth and occasioned the minimum of action from the pilot. For a start the captain took the nosewheel control and throttles and the first officer the wheel, while the engineer officer followed up on his throttles. An order from the captain and the engineer completed the throttle movement, while the captain, as the rudder became effective, took over the main controls. The maximum take-off power—3,500 b.h.p. per engine with A.D.I.—was used. The corresponding boost and r.p.m. are 58in and 2,700 r.p.m. Only the built-in supercharger is employed for take-off, the turbo-blower being for use at altitude.

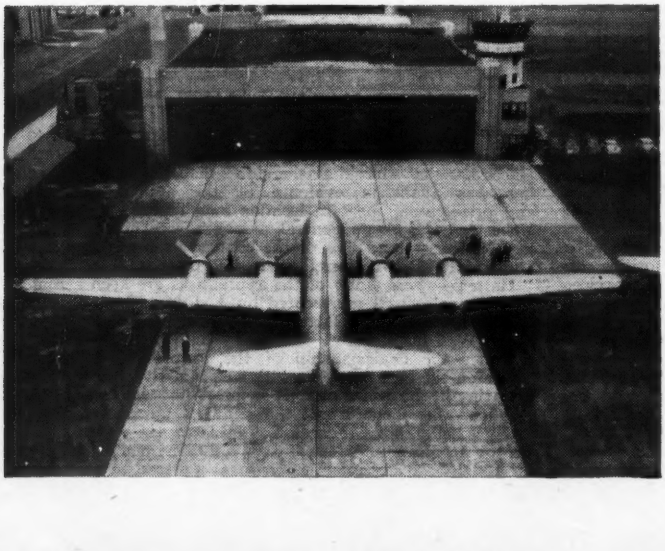
The speed mounted, 75-80 kt, 90-100 kt, and the first officer called "V.1," the speed above which the take-off is continued even if an engine fails or below which engines are shut down, pitch reversed and brakes applied. The V.1 speed varies with load, and on our take-off from Seattle with 132,000 lb a.u.w., it was 98 kt with rudder boost in use; at full load it is 109.5 kt.

Next, "V.2" was called—the minimum speed for holding direction following an engine-cut. This is equivalent to the three-engine safety speed for the load concerned. Take-off power is maintained on the Stratocruiser until it is established in the climb, and the gear is on the way up. After this, rated power (2,800 h.p., 2,550 r.p.m.) is used at 140 kt until 200ft is reached and, thereafter, climbing power at 165 kt climbing speed. Normal climb power is held with the aid of the turbo-blower at 50in manifold pressure. The last 10,000 lb of weight up to the 142,500 lb maximum makes a pronounced difference to the feel and length of take-off; c.g. and loading must also be watched very closely at full load. The aircraft is inclined to nose-heaviness.

The magnificent cockpit had impressed me from the start; and now, having seen the crew installed and working in complete comfort, and having experienced a night take-off sitting beside the first officer and with a supernumary captain seated beside the captain, I realized that in this feature at least the Stratocruiser exhibits superior qualities which no crew will wish to relinquish again. The only aircraft I can remember with anything like the space, comfort and view is that Rolls-Royce of old bombers, the Short Stirling.

As *Caledonia* circled Seattle to the right, the huge greenhouse nose offered an unsurpassed view up, down, ahead, sideways and even to the rear. It was quiet enough to talk freely and easily, the ride was smooth, and the temperature was comfortable.

The initial climb following a long take-off seemed a little sluggish, but, as height was gained, so the aircraft got into its stride and the rate of climb seemed to improve. An average rate of about 700 ft/min was maintained.



Caledonia at Hartford, the home of the United Aircraft Corporation. The picture was taken from a helicopter.

"Flight" photograph.

"Flight" photograph.

Long, low tankers provide the fuel for world-route airliners at Idlewild, New York.

Later, as we continued to climb, I walked back into the cabins and made a careful check-up on noise and vibration levels. The two main cabins I found very pleasant, the sound of engines and airscrews becoming more and more remote towards the tail. In the small front cabin and in the toilet compartments (which coincide with airscrews and engines) the noise and vibration are considerable. This, one feels, should be the subject of further examination with a view to improvement. The cocktail bar, however, is perhaps the most comfortable spot of all, and here one can sit and chat as peacefully as in a hotel lounge.

It is said that the Stratocruisers wag their tails, and this is true—true, in fact, of almost all large and long aircraft, particularly those with a single fin and rudder; but this effect, and the counter-shudder felt by the crew in the nose, are experienced only in rough air. At the intended cruising height of 25,000 ft there should be little or nothing in the way of turbulence.

No Boredom

After this preliminary examination in flight I moved forward again towards the cockpit, having sensed that we had levelled off, and it struck me as significant that only about two of the dozen or more passengers—by no means all seasoned air travellers—had remained in their seats after take-off. The others were wandering around, chatting, examining the passengers' instrument panel, or taking a drink below. This was something new; in my experience of aircraft with which the Stratocruisers will compete, the odd passenger who does anything on a long trip but sit and read, sleep, eat or looked bored, is an exception. These people were not bored and did not become so during the whole of the 9 hr 5 min flight. Admittedly, several turned in on the roomy and comfortable bunks for an hour or two of sleep. I later had a refreshing three hours on an upper port-side bunk myself.

Arriving in the cockpit, I noticed that we were flying at 19,000 ft at maximum w.m. cruising condition. This I knew to represent 1,750 b.h.p. per engine. Moreover, we were riding in and out of cloud and picking up some ice. It seemed that although the Stratocruiser would climb willingly to 28,000 or 30,000ft, it would not hold more than about 19,000ft on the permitted cruising power until the weight had gone down a little. At this time we had covered about 240 miles in a little over an hour.

With the wing-inspection lights on and thermal de-icers working we watched the ice disperse from the hot parts and heard small lumps fly off the airscrews. More built up, however, on spinners, parts of the nacelles and around the aileron hinges. Soon some slight tail-buffeting could be felt on the controls, and the speed dropped by about 20 kt; so, the crew having little experience of icing with this new aircraft, it was thought prudent to lose height over Spokane and call up for clearance on track at a new height. The ice had mostly gone when the new clearance came through as we circled the area of the city at about 11,000ft.

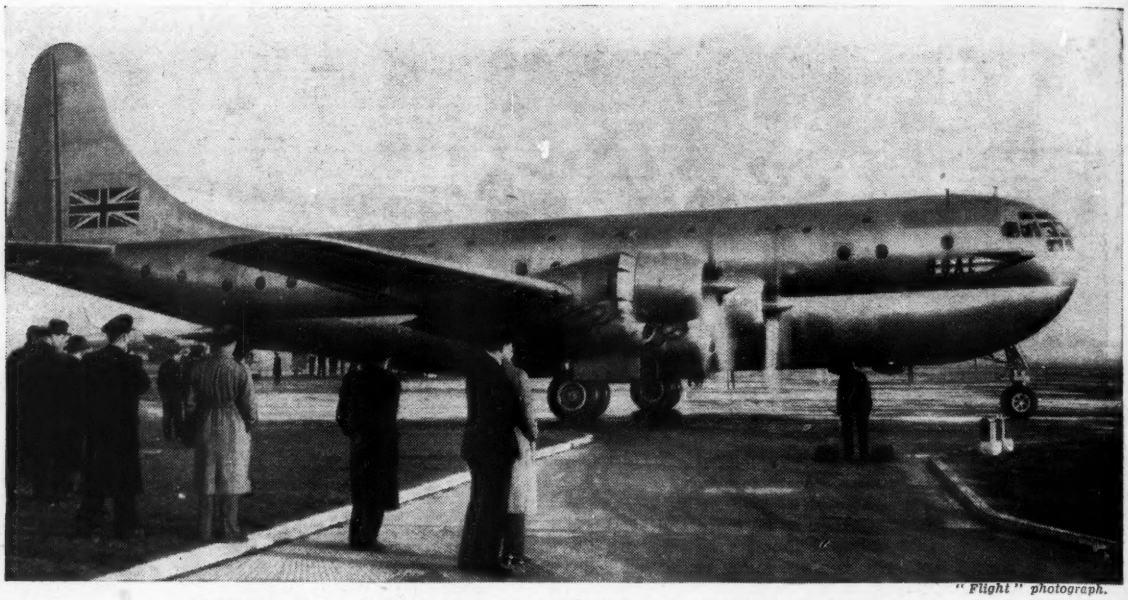
While iced-up we noted a loud, continuous hooting noise above the cockpit, and came to the conclusion it was caused by ice forming on the short radio-aerial masts. It may be desirable to keep these coated with some sort of anti-icing preparation, for the noise was irritating and distracting.

It was a great privilege to have been given the freedom of the ship for the long flight home, and one which enabled me to study the conditions of flying from both crew and passenger viewpoints. For the next few hours I settled back and enjoyed being a passenger. Aperitifs and a meal were served, and later a party of passengers took an early-morning nightcap in the bar. Afterwards I turned in and slept well except for an interruption when part of the heating system stopped working on my side of the cabin. This was nothing very serious, but it is to be hoped that the Stratocruiser is not going to be still another airliner in which an apparently good air-conditioning system proves temperamental. Incidentally, now that these aircraft have started their first operational winter, the heating for the pilots may need further study. The huge expanse of glass makes the nose portion very cold at 25,000ft, and on one occasion I personally found my legs and feet becoming uncomfortably cool after sitting in the first officer's pew for about half an hour, with the autopilot in control. The captain agreed.

On the transcontinental trip (the route of which was included in the map accompanying last week's instalment of this article) we got our first glimpse of scenery between Chicago and Toledo. Before this, only pin-points or patterns of lights during the night and cloud at dawn had been visible below.

Captain Andrew made a long, shallow descent towards

Captain Alan Andrew is greeted on arrival at London by Captain A. S. Wilcockson, who was Captain of the first *Caledonia*, a Short C-class flying boat.



"Flight" photograph.

Flagship's arrival. *Caledonia* taxies in at London Airport at the end of her delivery flight.

Collecting a Stratocruiser . . .

Idlewild on the Long Island coast, and in the lower "thousandteens" of feet the sun began to warm up the cockpit appreciably. Frozen condensation began to thaw, and, as happens on all large aircraft, "rain" came down over crew and controls and trickled over the floor. An addition to the crew equipment, one felt, might well be a rack of small umbrellas for use on descents from high altitudes. . . .

Weather was fine and clear as we joined the Idlewild circuit and the New York skyscrapers stood out well in the city haze to the north-west. Radio instructions for landing were brief and to the point, although it took a few moments to sort out the correct strip from the many criss-crossing runways on this huge new airfield.

"Approach" checks were called out (12 items). They include: brake pressures, "seat-belts and no smoking," fuel valves and pumps, cabin (de)pressure, r.p.m., A.D.I. (water/methanol injection for quick overshoot get-away), and flaps 25 deg (speed not to exceed 188 kt). Rounding the circuit, the "before-landing" checks followed: 2,300 r.p.m., landing gear checked (down at any speed under 200 kt), flaps as required (30 deg at under 171 kt; 45 deg—the maximum—at under 159 kt), autopilot out, rudder boost on; and others to a total of eleven.

"Clear for final approach and landing" was signalled from control and the captain, concentrating on flying controls, called for the power he required to maintain a steady approach: "25 inches," "20 inches," and so on. The final extension of the vast area-increase flaps made an appreciable difference, and was called for shortly after the final turn-in had been completed. At about the same time speed was reduced from 140 to 130 kt, and this was held until the check before round-out. A good pull with a little engine on is needed to land in a tail-down attitude with average landing weight and a speed of about 115 kt. The maximum landing weight permitted is 121,700 lb. The Stratocruiser does not land tail-down at all readily, and, in fact, is quite prepared to land nosewheel first. On this occasion Captain Andrew greased her on, and with a burst of power from the inboard Wasp Majors in reverse pitch, we pulled up with half the runway to spare.

There followed arrival formalities, admiring examination of the flagship by B.O.A.C. and other staff at Idlewild, preparation of papers for the flight to London next day, clearance for Hartford and, in the odd minutes between, lunch.

The flight to Hartford was interposed to permit a change of airscrews—a case of the mountain going to Mahomet. For anyone who is not familiar with the Hamilton Standard airscrews fitted to B.O.A.C. Stratocruisers, a word of description may not be out of place. They are of the four-blade, square-tipped windmill type of 16ft 8in diameter, and they provide for reverse-pitch braking as well as constant-speed operation and manual and automatic feathering. Electric de-icing equipment is provided, and the engine reduction gearing is of 0.375:1 ratio. Blade angle settings are: fine, 18 deg; feather, 86 deg; braking −18 deg.

Each blade is built rather like the wing of a light aircraft—though of different materials—with spar and skin envelope. The spar, of steel, tapers off to the tip and the thin steel skin is wrapped round and welded at the open edge and tip. Internally supported by a rubber filling, the skin is attached to the spar by a special brazing process. The reason for changing airscrews on B.O.A.C. Stratocruisers, but not as yet on those operated by other companies, is chiefly one of convenience. One or two instances of fatigue cracks in the skin of blades have been discovered, and they result from panting at points near the spar where the rubber filling process has left small cavities. Such cavities can be detected in advance, filled by injection of cement, and cracking prevented. Test runs with cracked-skin blades have indicated that there is no immediate risk of failure, so other operators based in the United States will attend to their airscrews on the next convenient routine inspections.

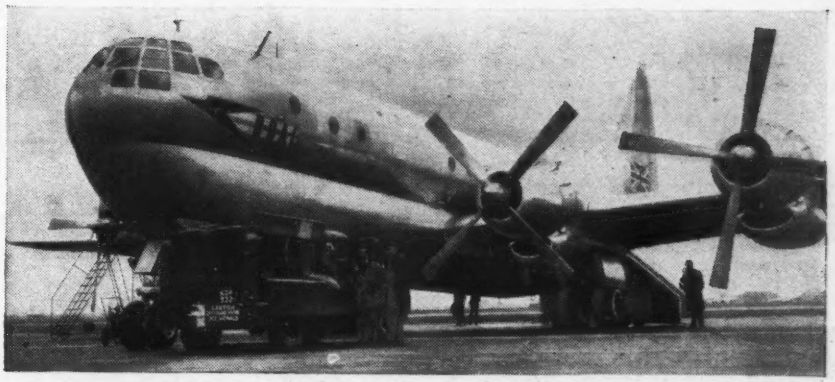
Balance may be upset, but not by more than 100 in-lb, and as the airscrews are four-bladers, the blades can, it seems, be rematched as opposites, though probably not in the original sequence. Improved sealing against moisture at the roots was also provided when B.O.A.C. airscrews were changed.

The short flight north to Hartford, Connecticut, took 1hr 6min (20.30-21.36hrZ). There was no reason to go high, so we had a very interesting view of the country below, though towards the end of the trip light began to fail. Having selected the correct airfield of Hartford's two (which have overlapping circuits but which are separated by the Connecticut River), Captain Andrew took the Stratocruiser in to land on a runway which looked distinctly small after those at Idlewild. In fact, there was plenty of room, and again using only the two inboard engines for braking, we pulled up with plenty to spare and with wheel brakes in reserve.

The B.O.A.C. crew and passengers spent a very pleasant evening as guests of the United Aircraft Corporation—Hamilton Standard and Pratt and Whitney Aircraft Divisions in particular. In the morning we all toured the workshops and discussed those aspects of the work in the huge East Hartford plant which interested us most. At lunch time, the Corporation kindly arranged for me to fly to La Guardia in its Sikorsky 51 in order to have time to examine the Dehmel Trainer (described in the previous instalment) before the Stratocruiser called in again at Idlewild and then took off at once for London. A foretaste of what may one day be commonplace was provided by the swift, comfortable, door-to-door service of

Collecting a Stratocruiser . . .

Still another B.O.A.C. Stratocruiser — *Centaurus* — arrives in England. It is now thought that all ten of the fleet will have been delivered by mid-March.



the helicopter. It also provided me with a magnificent air tour of the north shores of Long Island Sound.

And so the time to take leave of the North American continent came round. We had a little farewell party in the restaurant and looked longingly at the stacks of chocolate bars, the food counters, and the slot-machine nylons as we walked through the temporary buildings to the aircraft which had arrived back an hour or two earlier from Hartford. Refuelling was complete, and everything had been stowed away ready for the flight. We were assured of quite good weather and a strong tail-wind for most of the Atlantic crossing. The intention was to fly in one hop to Shannon (which, on a great-circle route, takes one near to Gander) and possibly, if winds were sufficiently favourable, to overfly Shannon and go non-stop to London.

The take-off from the long, well-illuminated runway was exactly as before—a precision procedure, as it should be—and quickly we climbed up through layers and patches of cloud. Until we neared Gander, flying on the range, the cruising height was again 19,000ft, but as soon as possible we climbed up by stages to 25,500ft, which offered the best compromise in cruising conditions, tail-wind advantage, and keeping clear of the upper cloud-layer.

Conditions at this time, as I noted them from the first officer's seat, were: height, 25,500ft; 2,200 r.p.m.; 38-39in boost; indicated air-speed, 190-195 kt; outside air temperature, −31 deg C (corrected for −7.6 deg compressibility error); torquemeter, 190 lb. The engineer gave me the aircraft weight as 117,500 lb. Making a few calculations, the corrected air speed turned out to be 282 kt, and the navigator confirmed that with the 45 kt tail-wind the ground speed was 327 kt.

From torquemeter pressure, a constant and the r.p.m. (190 × 0.0043 × 2,200), the output per engine worked out at a fraction under 1,800 b.h.p.—a little over the 1,750 at present recommended but under the makers' quoted figure of 1,900 b.h.p.

Operational Economy

If full advantage is to be taken of the Stratocruiser's performance it is important that the full cruising power of 1,900 b.h.p. be available for use as soon as possible. This will permit a higher cruising altitude from the start of the journey with full load. It remains to be seen whether Stratocruisers can operate as economically as their older competitors on the North Atlantic route. Certainly they will have the great advantage of being able quite frequently to cut out intermediate stops on the west-east flights and of being able to fly east-west at full load without a delay for refuelling in Iceland. Passengers bound from London to New York do not take very kindly to stops at Prestwick and Gander, let alone an additional one in Keflavik in the small hours of the morning.

By 7.30 hr Z we were 19 minutes ahead of schedule, and if the favourable wind continued right across, a single "hop" with a chance of a record time was quite possible.

Once we were well established on the North Atlantic leg of the flight I returned to the cabin for dinner, first watching the steward and stewardess in action in their new galley. It seemed to me that they had insufficient room to lay out meals or stack used trays and dishes, even for the limited number of meals served on this occasion. Certainly practice should improve matters, but it may be necessary to ask all passengers not to pass the galley when meals are being served, and also to provide some folding shelves in the recess leading to the main door immediately opposite the galley, for use during mealtimes.

Seeing coats and hats folded on unused seats also reminded me that no coat-hanging space is provided in the B.O.A.C. layout. The mid toilet-compartment might well be replaced by hanging space if full aircraft are expected, for I feel sure few passengers will care to use it in its present exposed position and with its present dimensions. This is not to say that an additional toilet is not required at the rear, particularly if the layout is to be kept flexible with two-class travel in mind. Could not, perhaps, one of the places on the rear triple-seat be sacrificed in favour of a rear toilet behind the steward's desk?

The lack of space for hanging coats is also apparent in the crew compartment, and here again the possibility of modifying a toilet compartment—something less elaborate would satisfy most crews—so that better clothes-hanging facilities could be made available, might well be an improvement.

As we flew on through the night sky, clear now of all upper cloud and bright with moon and starlight, I realized how much I was enjoying the flight on the Stratocruiser. This enjoyment had been increased by the free, friendly spirit which had existed all along among crew and passengers. There is, of course, a corresponding *camaraderie* in a ship—a feeling of all being in the thing together—and the same regret on having to disembark at the journey's end.

A visit to the cocktail bar seemed to have its points, so down the stairs I went. The mirrors at the forward end help to give an impression of spaciousness, unavoidably offset to some extent by the cramped (though probably adequate) little bar and food lift each side of the door to the aft freight compartment. One must look behind the mirrors, which can be folded down, for undercarriage emergency retraction. Provision is made for two flap motors to be removed bodily, if need be, and attached to the undercarriage winding shafts.

The luggage compartments are all pressurized and accessible in flight; in fact, the only three portions of the fuselage not pressurized are the nosewheel box, central wing area and tail cone. Elaborate precautions against fire have been provided, immediate warning being given by carbon monoxide and smoke detectors. Masks and oxygen are provided for emergencies, to enable the crew to locate and extinguish a fire among freight and baggage. So sensitive are the C.O. detectors that they have to be desensitized when the aircraft is on the tarmac or awaiting a turn to take off, because the carbon monoxide from the exhaust of other machines in front will give a false warning in the aircraft.

With these and other thoughts in mind I decided once more to sample the comfort of the roomy bunks, and remembered nothing more until bright sunshine flooded through the small upper porthole and Ireland was less than an hour away.

It seemed that the helping wind had died out midway across, and so we were to make a routine landing at Shannon. In fact, we flew in over the damp, deep-green Irish fields—each unbelievably small after the vast expanses of Canadian ranches and American farms—and touched down at 11.56, after 9 hours 18 minutes in the air.

Of the hour and three-quarter flight on to London after breakfast there is little to say. The ride was smooth and comfortable, and our American friends were most interested to see the Brabazon assembly hall—though no Brabazon—as we flew over Bristol.

A wet and hazy Heathrow soon came into view, and with the minimum of delay we were down and cutting engines on the tarmac. Crew and passengers were subjected to a brief and orderly immigration, health and customs examination; then, as the passengers embarked for London on the coach, the B.O.A.C. crew prepared to fly their flagship back to base at Filton.

CORRESPONDENCE

The Editor of "Flight" does not hold himself responsible for the views expressed by correspondents in these columns. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

RADAR AIDS

IN your leading article "Aids" in *Flight* of December 8th you question whether the (radar) industry itself is to blame for the current lack of equipment. In part, it undoubtedly is. Essentially, the matter is one of plain business economics. The construction of domestic radio sets offers a far greater profit margin than do Government contracts for aeronautical radio and radar equipment, plus the fact that domestic radio sets can be planned on a production-line basis—and so reduce costs—whereas aviation work entails such relatively small numbers that the "line" system cannot be utilized sufficiently extensively to pay. Furthermore, the inspection standard on aeronautical equipment is uneconomically high.

The best radio and radar sets in the world can be developed by T.R.E., but they cannot be installed in aircraft until somebody builds them; and until the Treasury relent sufficiently to enable the contract prices to compete with profits from domestic sets, there does not seem to be much hope for change in the situation.

BARRIE ALDBURY.

London, W.1.

"HIRE OR REWARD"

FOLLOWING the publication in your issue of December 1st of details of a recent prosecution in the Croydon Magistrate's Court, a number of enquiries have been received by this Association in regard to the repercussions of this case on members of flying clubs, particularly in view of the extract from the submission of Counsel for the defence, which you report as follows:—

> "In conclusion, he pointed out to the Court the importance of the case as a test case, which, if it was found to be proved against Mr. Hoggaerts, would have a considerable stultifying effect upon all private pilots, who could not afford to defray out of their own pockets the full charges involved in private flying. This, in its turn, would react very unfavourably upon the activities of private flying clubs, with obvious undesirable consequences."

The Croydon case is, in fact, the second case of this sort to come before a Magistrate's Court this year, and I append a circular sent by this Association to all our member clubs on July 12th last:—

> "At York Magistrate's Court recently an 'A'-licensed owner of an Auster was fined for carrying a passenger and her two children for hire or reward, and also for not having a Certificate of Safety for the aircraft during the flight in question.
>
> "The facts were that the owner intended flying to Germany on business. He heard from an acquaintance that a lady was anxious to go to Germany with her two children to join her husband who was working there. The owner got in touch with the lady and agreed to take her and the children for a sum of money which was paid before the flight commenced.
>
> "It was agreed at Court that the flight would have taken place even if the passengers had not travelled, and that it was an isolated case, i.e., that the owner did not make a practice of collecting a contribution for the passengers he carried. Nevertheless, the Magistrates held that the flight was for hire or reward and that therefore the aircraft became a public transport aircraft, needing a Certificate of Safety for the aircraft and a 'B' Licence (or Commercial Pilots' Licence) for the pilot.
>
> "It must be emphasized that the conviction arose out of the facts of that particular case, but it does raise the important subject of possible proceedings when expenses are shared.
>
> "Members of flying clubs are protected under the Order, in so far as club aircraft are concerned, with regard to sharing expenses amongst fellow members, but once a passenger is carried who is not a member of the flying club, then the sharing of expenses might constitute carriage for hire or reward. It is not possible to lay down a rule of what constitutes carrying for hire or reward, because each case depends on its own facts, but as a general principle owners are advised not to make bargains with passengers, and clubs should endeavour to ensure that where there is any sharing of expenses for the hire of club aircraft the persons so sharing are members of the club."

In view of the prominence which you have given to the extract from the Croydon Defence Counsel's submission, I would be grateful if, in the interest of members of flying clubs, you would be good enough to publish the circular quoted above.

E. SOUTHERN,
Acting Secretary,
Association of British Aero Clubs and Centres.

London, W.1.

NAVAL SQUADRON'S HISTORY

WITH reference to the recent article entitled *Naval Night Fighters* which appeared in *Flight* of November 24th (and which in fact was, amongst other things, a record of the history of 809 Squadron), as a former squadron commander of this unit during the recent war I feel that it should be put on record that the description given of the war-time history of the Squadron is not, in fact, accurate.

It is stated that after the Squadron's career in *Victorious* it was disbanded, and that in 1945 the Phœnix rose again at Nutts Corner and the Squadron embarked for the Pacific.

On behalf of some sixty pilots who flew in the Squadron operationally between the time that it left *Victorious* and the time that it embarked for the Pacific, I feel I must place on record that, after a brief spell of working-up, the Squadron, equipped with Seafire aircraft, embarked in H.M.S. *Unicorn* to cover the landings at Salerno, and that soon afterwards, in 1944, it embarked in H.M.S. *Stalker* with a full squadron of Seafires for the Mediterranean, where, in company with ships of that force, it covered the landings in the South of France invasion. It also did a brief operational attachment with the Desert Air Force in Italy, and, furthermore, did many successful operations in the Ægean Sea at the time when the German forces were withdrawing from Greece.

Bletchingly, Surrey. H. D. B. EADEN.

[We are glad to publish this amplification of 809's history, but must disclaim responsibility for not having included it in our account; no mention of the activity referred to by our correspondent was embodied in the Squadron record from which material for the article was collected.—ED.]

B.O.A.C. REDUNDANCIES

THE comment which you attribute to B.O.A.C. in *Flight* dated December 1st, regarding the above is apt to give a misleading impression. When the Corporation say they have had discussions with the trade unions on the matter they do not mean they have had discussions with *the* trade union representing the majority of their engineering staff, i.e., the Ae.E.A.

What they do is discuss the question (and all others) with a group of T.U.C. trade unions which form the so-called "National Joint Council for Civil Air Transport". This is a body established in December, 1946, by the Minister of Labour to ensure that only T.U.C. unions would be consulted by B.O.A.C. It is, of course, a fact that the T.U.C. unions concerned are, for all practical purposes, the Government of this country today, and, since the Government controls B.O.A.C., when the latter consults the unions it does little more than go to its employer for instructions.

The rank-and-file B.O.A.C. engineer remains, as always, outside and in the dark.

Croydon, Surrey. J. H. STEVENSON,
Aeronautical Engineers' Association.

FORTHCOMING EVENTS

Dec. 15.	R.Ae.C.: K.L.M. films, "Caribbean Ahead" and "Batavia Airport" (At Londonderry House.)
Dec. 15.	R.Ae.S.: "Navigational Systems and Instrument Aids," by Dr. D. E. Adams, B.Sc., A.Inst.P., and Dr. A. N. Uttley, B.Sc., Ph.D.
Dec. 21.	R.Ae.S. (Weybridge): "Round the World in 90 Days," film by William Courtenay, M.M.
1950	
Jan. 3.	R.Ae.C.: "Round the World in 90 Days" (Part II), film by William Courtenay, M.M. (At Londonderry House.)
Jan. 7.	British Interplanetary Society: "The Circum-lunar Rocket," by K. W. Gatland and A. E. Dixon.
Jan. 11.	R.Ae.S. (Weybridge): Brains Trust.
Jan. 11	Royal United Service Institution: "Higher Defence Organization," by Lt.-Gen. Sir Leslie C. Hollis, K.B.E., C.B., R.M.
Jan. 14.	British Interplanetary Society (Manchester): "Space Stations," by E. Burgess.
Jan. 18	Royal United Service Institution: "Airfields in a War of Movement," by A. Cdre. T. G. Pike," C.B., C.B.E., D.F.C.
Jan. 19	R.Ae.S. Section Lecture-symposium: "Acoustical Aspects of Recent Aerodynamic Research" (jointly with Acoustics Group of the Physical Society).
Jan. 20.	Institute of Physics (Manchester): "Temperature Measurement," by J. A. Hall.
Jan. 20.	London Aeroplane Club: Annual Dinner Dance.
Jan. 24.	R.Ae.C.: "Air Travel through the U.S.A.", film by William Courtenay, M.M. (At Londonderry House.)

SERVICE AVIATION

Royal Air Force and Naval Aviation News and Announcements

DOMINION VISITOR: As reported on this page, the Canadian Defence Minister, Mr. Brooke Claxton, last week visited the Vampire base at Odiham. He is shown meeting P/O. P. C. Skinner of 72 Squadron; seen also are Mr. Arthur Henderson, the Air Minister (centre), and W/C. D. C. Stapleton, the Station Commander.

"Flight" photograph.

Odiham Visited

CANADA'S Minister of National Defence, the Hon. Brooke Claxton, paid a brief visit to R.A.F. Station Odiham (W/C. D. C. Stapleton) last Friday afternoon. He was accompanied, in an inspection of the maintenance, administration and flying of the resident Vampire Wing, by other distinguished visitors, including the Rt. Hon. Arthur Henderson, Secretary of State for Air; Air Marshal Sir Basil Embry, A.O.C.-in-C, Fighter Command; A.V-M. S. F. Vincent, A.O.C. 11 Group; A.V-M. Campbell, R.C.A.F.; Cdre. Bidwell, R.C.N.; and Maj.-Gen. Clark.

Early in his tour of the station, Mr. Claxton inspected a line-up of nine trim, recently delivered Vampire 5s—three aircraft of each Odiham squadron. In front of each machine stood its pilot, fitter and rigger, and Mr. Claxton paused to chat with several pilots and ground crews. All the station's servicing personnel have been equipped with new green anti-kerosene suits, of rubberized material, and rubber boots which prevent damage to the aircraft's finish. The resultant uniformity helped to give the station activities an air of smartness which could easily have been marred by a profusion of miscellaneous overalls.

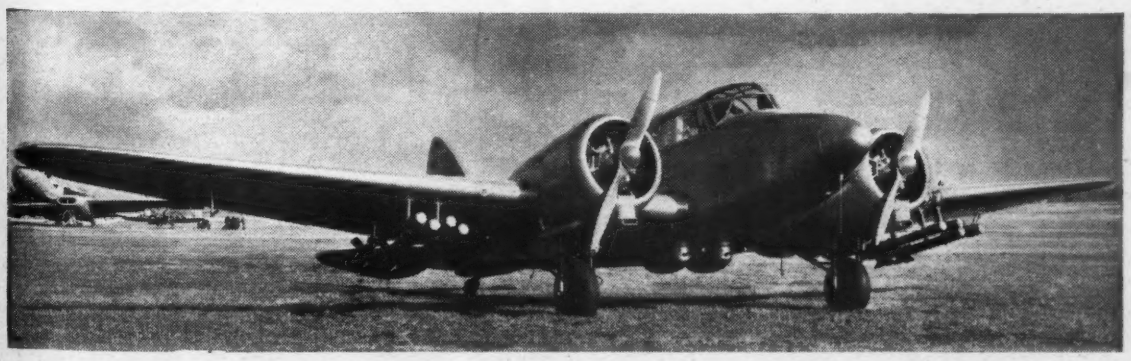
The party inspected a number of hangars, workshops and offices before making a concluding visit to air traffic control. From the tower roof they witnessed a short but superlative flying display which was a credit to Fighter Command. For a winter's day the visibility was excellent, but an icy wind (relieved occasionally by a waft of warm kerosene fumes) inevitably detracted from the pleasure of the spectacle. Belying the implication of the squadron letters "US" on its fuselage, a single Meteor 4 began the display with sweeping loops above the centre of the airfield. Tight turns were momentarily traced by contrails against the chill sky, and the performance was sustained by high-speed rolling with notably little loss of height. An infrequent Meteor manœuvre was the eight-point roll, which proved to be an accurate—and not unfamiliar—hint as to the identity of the demonstrator, Plt. II Murphy.

Odiham pilots have, for the most part, given up their Vampire 3s in favour of the later, clipped-wing Mk. 5s; they are naturally less familiar with the latter variant, which differs in fore-and-aft control characteristics. However, there has certainly been no drop in the renowned Odiham standard of formation aerobatics. The performance given last Friday by five 54 Squadron pilots was superb and can rarely have been equalled. Four aircraft (piloted by F/L. Bennett, F/O. Marsik, Plt. I Wood and Plt. II Skinner) would loop or roll with unfailing and almost uncanny precision, and—as they re-formed "off-stage" between each item—F/L. Wingate, as "individualist," dashed in to hold the attention of an appreciative audience. Vampires of the other squadrons were airborne on a routine exercise during the afternoon, but succeeded in showing the flag by means of contrails at 20,000ft.

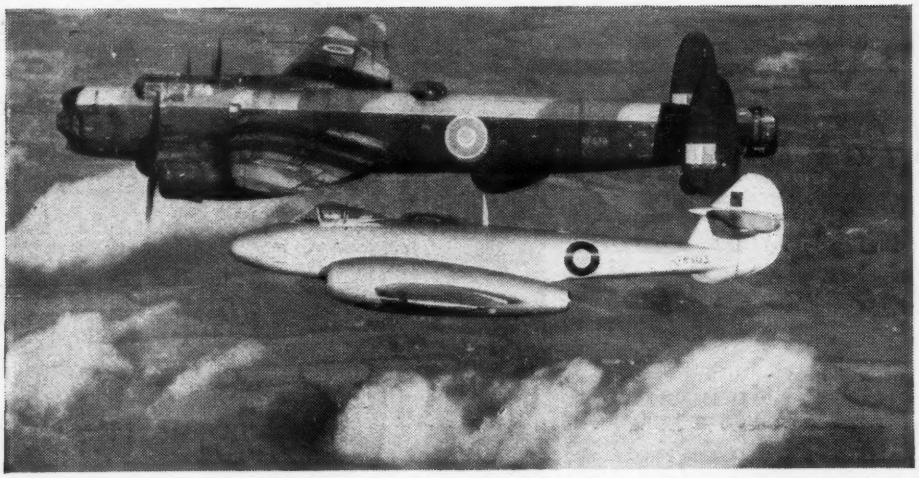
R.A.F. Appointment

GROUP CAPT. J. N. T. STEPHENSON has been appointed Commandant of the R.A.F. Staff College, Andover, with the acting rank of Air Commodore. Until recently he was Group Captain (Operations) at Headquarters, B.A.F.O., a post he held for three months from last July after having commanded the R.A.F. Station at Celle.

Before going to Germany, A.Cdre. Stephenson was on the directing staff of the Staff College for a year, joining it in October, 1947, shortly before it moved



TWO-GUN TRAINER: Eight 250-lb rocket projectiles and two ·303-in Browning machine guns give a belligerent appearance to this Airspeed Consul, shown at Boscombe Down, where armament tests have recently been conducted with success. Both the Consul and the Oxford can carry this armament, which was installed to meet the training requirements of an overseas air force.



AERIAL ANALOGY: A comparative study of two standard R.A.F. aircraft is made possible by this unusually intimate view. The Gloster Meteor 4 interceptor, nearer the camera, appears relatively larger than is the case; its fuselage length is 43ft. 6ins., compared with the 73ft. 3½ins. of the Avro Lincoln heavy bomber. At 82,000 lb. "all-up," the Lincoln weighs as much as five Meteors: its maximum sea-level speed of 290 m.p.h. is nearly half that of the Meteor (585 m.p.h.).

"Flight" photograph.

SERVICE AVIATION . . .

to Andover from Bulstrode Park Born in November, 1907, he was commissioned in 1928 from the Royal Air Force College, Cranwell. He qualified as an A.1 flying instructor in 1931 and graduated at the R.A.F. Staff College in 1939.

R.A.F. Mountaineering

MR. W. H. Tilman, leader of the last Mount Everest expedition (in 1938) has accepted an invitation to be a vice-president of the R.A.F. Mountaineering Association in place of the last, Mr. F. S. Smythe. The Association, which has a membership of 111, plans to hold a climbing meet in Scotland next February.

New P.T.I. Badge

THE R.A.F. has introduced an embroidered badge, consisting of crossed swords with an eagle superimposed and surmounted by a crown, worked in light blue silk, for wear by airmen and airwomen of the rank of flight sergeant and below who are employed as physical training instructors. The badge, which supersedes the metal badge bearing the device of three arms and three clubs, will be worn on the right sleeve immediately above the badge of rank. It is similar in design to the physical training instructor's badge originally worn in the R.A.F.

FOR W.R.A.F. OFFICERS: Sq/O. Martin, of the Air Ministry, displays the new-style beret which is to be worn by W.R.A.F. officers with No. 2 (home) dress. The question of new headwear for airwomen is now under consideration.

Bikes for B.A.F.O.

THREE hundred bicycles, bought from service welfare funds, will shortly be issued free to R.A.F. stations throughout the British Air Forces of Occupation, Germany. The object is to foster the formation of unit cycle clubs. Cycles will be for use only in off-duty hours and will be on loan at a very small charge, to be fixed independently by each station, to cover the cost of depreciation and repairs.

A Worthy Aim

THE welcome news is announced that an organization has been formed, within the R.A.F., with the ultimate object of providing gliding facilities and training for all members of the Service at a cost within their means. Such a scheme has, of course, been operated by B.A.F.O. in Germany since 1945, and the results have been outstanding. A noteworthy feature of B.A.F.O. gliding has been the exceptional interest shown by non-flying members of the R.A.F., many of whom have become extremely proficient in the art of soaring. Apart from the value of gliding as an exhilarating pastime, the Service obviously benefits from the intimate knowledge of flying problems gained by ground crews.

The R.A.F. Gliding and Soaring Association, as the new organization is entitled, was formed following a meeting at the Air Ministry on November 14th. Air Marshal T. M. Williams, the C.-in-C., B.A.F.O., has become president of the Association, and G/C. G. J. G. Paul is its chairman. S/L. D. Martin Butcher is the secretary, and chief flying instructor is F/L. R. C. "Jock" Forbes, who was recently appointed C.O. of the Reserve Command Instructors' Gliding School. The Association's committee contains representatives of all Home Commands and No. 90 Group.

Flying membership will at first be limited to those with gliding qualifications, and later to those with some experience. When the Association itself has gained experience (and reputation) *ab initio* training will begin. Detling—the base of the Reserve Command instructors' school—will be the Association's first gliding site, subject to official approval. Later, it is hoped that an exclusive central site will be established (with hangars, maintenance facilities and club-house, etc.), and that associated clubs will be formed on R.A.F. stations.

A launching winch and seven German-built primary and intermediate gliders have already been offered to R.A.F.-G.S.A. by the Association of B.A.F.O. gliding clubs. It is hoped to supplement this equipment with British-made high-performance sailplanes and other equipment, with the aid of a loan or grant. International gliding contests are to be held in Sweden next summer, and if sufficient experience and the high-performance aircraft are available, the Association intends to enter a team.

New Listening-Out Service

CERTAIN R.A.F. stations are to keep an additional all-round-the-clock listening watch on the wireless frequency used by civil and other aircraft for international aeronautical distress calls. At some airfields there already is a continuous listening watch for distress calls on the frequency used by R.A.F. aircraft for flight information calls, while the Air Ministry ocean weather ships, when on patrol, listen out on the frequency used by civil aircraft and their airdromes.

In an emergency, many searching R.A.F. and R.N. vessels will also be able to listen out in future for international air distress calls, if need be, as well as keeping watch continuously on the appropriate flight information frequency. This is in addition to the listening watch for S.O.S. calls which they then keep on the international maritime distress frequency used by shipping, and a further watch which some can maintain continuously on the frequencies used by R.A.F. aircraft for navigation wireless calls.

Reunion

A REUNION for all ranks of No. 17 O.T.U. will be held at the Victory Club, 73, Seymour Street, Marble Arch, London, W.C.2, on Saturday, January 21st, 1950, at 1830 hr. Wives and husbands invited. Tickets from Miss "Anti" Clark, 18, Atwood Road, Hammersmith, London, W.6.